



Section 1 - Identification of The Material and Supplier

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Chemical nature: Oxyfluorfen is a diphenyl ether derivative.
Trade Name: Cavalier Herbicide
Product Use: Agricultural herbicide for use as described on the product label.
Creation Date: December, 2002
This version issued: August, 2012 and is valid for 5 years from this date.

Section 2 - Hazards Identification

Statement of Hazardous Nature

This product is classified as: Hazardous according to the criteria of SWA Australia.

Not subject to the ADG Code when transported in Australia by Road or Rail in packages 500kg(L) or less; or IBCs (refer to SP AU01). However if transported by Air or Sea, this provision does not apply. Then the product is classed as Dangerous (Class 9 Environmentally Hazardous) by IATA and IMDG respectively. See details below and in Section 14 of this MSDS.

Risk Phrases: R36/38. Irritating to eyes and skin.

Safety Phrases: S24/25. Avoid contact with skin and eyes.

SUSMP Classification: S5

ADG Classification: Class 9: Miscellaneous dangerous goods.

UN Number: 3082, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.

Emergency Overview

Physical Description & colour: Clear, dark amber liquid.

Odour: Aromatic, fragrant floral odour.

Major Health Hazards: Oxyfluorfen is practically nontoxic by ingestion, with reported oral LD₅₀ values of 5000 mg/kg in both rats and dogs, and 2700 to 5000 mg/kg in mice. The dermal LD₅₀ is greater than 5000 mg/kg in both rats and rabbits, also indicating slight toxicity by this route. It causes no skin irritation in rabbits, no skin sensitization in guinea pigs, and moderate eye irritation in rabbits. Irritating to eyes and skin.

Potential Health Effects

See section 11 for Chronic exposure studies.

Inhalation

Short term exposure: Available data indicates that this product is not harmful. However product may be mildly irritating, although unlikely to cause anything more than mild transient discomfort.

Skin Contact:

Short term exposure: Available data indicates that this product is not harmful. It should present no hazards in normal use. However product is a skin irritant. Symptoms may include itchiness and reddening of contacted skin. Other symptoms may also become evident, but all should disappear once exposure has ceased.

Eye Contact:

Short term exposure: Available data shows that this product is not harmful. However product is an eye irritant. Symptoms may include stinging and reddening of eyes and watering which may become copious. Other symptoms may also become evident. If exposure is brief, symptoms should disappear once exposure has ceased. However, lengthy exposure or delayed treatment may cause permanent damage.

Ingestion:

Short term exposure: Available data shows that this product is not harmful. However, this product may be irritating to mucous membranes but is unlikely to cause anything more than transient discomfort.

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**Carcinogen Status:**

SWA: No significant ingredient is classified as carcinogenic by SWA.

NTP: No significant ingredient is classified as carcinogenic by NTP.

IARC: No significant ingredient is classified as carcinogenic by IARC.

Section 3 - Composition/Information on Ingredients

| Ingredients | CAS No | Conc, % | TWA (mg/m ³) | STEL (mg/m ³) |
|---------------------------------|------------|---------|--------------------------|---------------------------|
| Oxyfluorfen | 42874-03-3 | 24 | not set | not set |
| N-Methyl-2-pyrrolidone | 872-50-4 | 10.8 | 103 | 309 |
| Aromatic hydrocarbons | 64742-94-5 | 61.7 | not set | not set |
| Other non hazardous ingredients | secret | to 100 | not set | not set |

This is a commercial product whose exact ratio of components may vary slightly. Minor quantities of other non hazardous ingredients are also possible.

The TWA exposure value is the average airborne concentration of a particular substance when calculated over a normal 8 hour working day for a 5 day working week. The STEL (Short Term Exposure Limit) is an exposure value that should not be exceeded for more than 15 minutes and should not be repeated for more than 4 times per day. There should be at least 60 minutes between successive exposures at the STEL. The term "peak "is used when the TWA limit, because of the rapid action of the substance, should never be exceeded, even briefly.

Section 4 - First Aid Measures**General Information:**

You should call The Poisons Information Centre if you feel that you may have been poisoned, burned or irritated by this product. The number is 13 1126 from anywhere in Australia (0800 764 766 in New Zealand) and is available at all times. Have this MSDS with you when you call.

Inhalation: No first aid measures normally required. However, if inhalation has occurred, and irritation has developed, remove to fresh air and observe until recovered. If irritation becomes painful or persists more than about 30 minutes, seek medical advice.

Skin Contact: Quickly and gently, blot or brush away excess chemical. Wash gently and thoroughly with water (use non-abrasive soap if necessary) for 20 minutes or until chemical is removed. Under running water, remove contaminated clothing, shoes and leather goods (e.g. watchbands and belts). If irritation persists, repeat flushing and obtain medical advice. Completely decontaminate clothing, shoes and leather goods before reuse or discard.

Eye Contact: Quickly and gently blot or brush away product. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water until the product is removed or until a few minutes after irritation has ceased, while holding the eyelid(s) open. Take care not to rinse contaminated water into the unaffected eye or onto the face.

Ingestion: First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.

Section 5 - Fire Fighting Measures

Fire and Explosion Hazards: This product is classified as a C1 combustible product. There is a slight risk of an explosion from this product if commercial quantities are involved in a fire. Violent steam generation or eruption may occur upon application of direct water stream on hot liquids. Vapours from this product are heavier than air and may accumulate in sumps, pits and other low-lying spaces, forming potentially explosive mixtures. They may also flash back considerable distances.

Fire decomposition products from this product may be toxic if inhaled. Take appropriate protective measures.

Extinguishing Media: Try to contain spills, minimise spillage entering drains or water courses.

Fire Fighting: If a significant quantity of this product is involved in a fire, call the fire brigade. There is little danger of a violent reaction or explosion if significant quantities of this product are involved in a fire. Recommended personal protective equipment is full fire kit and and breathing apparatus.

Flash point: Not flammable.

Upper Flammability Limit: No data.

Lower Flammability Limit: No data.

Autoignition temperature: No data.

Flammability Class: C1

Section 6 - Accidental Release Measures

Accidental release: In the event of a major spill, prevent spillage from entering drains or water courses.

Immediately call the Fire Brigade. Wear full protective clothing including face mask, face shield and gauntlets. All skin

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areas should be covered. See above under Personal Protection regarding Australian Standards relating to personal protective equipment. No special recommendations for clothing materials. Stop leak if safe to do so, and contain spill. Absorb onto sand, vermiculite or other suitable absorbent material. If spill is too large or if absorbent material is not available, try to create a dike to stop material spreading or going into drains or waterways. Sweep up and shovel or collect recoverable product into labelled containers for recycling or salvage, and dispose of promptly. After spills, wash area preventing runoff from entering drains. If a significant quantity of material enters drains, advise emergency services. Full details regarding disposal of used containers, spillage and unused material may be found on the label. If there is any conflict between this MSDS and the label, instructions on the label prevail. Ensure legality of disposal by consulting regulations prior to disposal. Thoroughly launder protective clothing before storage or re-use. Advise laundry of nature of contamination when sending contaminated clothing to laundry.

Section 7 - Handling and Storage

Handling: Keep exposure to this product to a minimum, and minimise the quantities kept in work areas. Check Section 8 of this MSDS for details of personal protective measures, and make sure that those measures are followed. The measures detailed below under "Storage" should be followed during handling in order to minimise risks to persons using the product in the workplace. Also, avoid contact or contamination of product with incompatible materials listed in Section 10.

Storage: Note that this product is combustible and therefore, for Storage, meets the definition of Dangerous Goods in some states. We suggest you consult your state's Dangerous Goods laws in order to clarify your obligations regarding the storage of this product.

Make sure that containers of this product are kept tightly closed. Pressure may build up in sealed containers, so do not seal tightly. Keep away from combustible materials. Make sure that the product does not come into contact with substances listed under "Materials to avoid" in Section 10. Some liquid preparations settle or separate on standing and may require stirring before use. Check packaging - there may be further storage instructions on the label.

Section 8 - Exposure Controls and Personal Protection

The following Australian Standards will provide general advice regarding safety clothing and equipment:

Respiratory equipment: **AS/NZS 1715**, Protective Gloves: **AS 2161**, Occupational Protective Clothing: AS/NZS 4501 set 2008, Industrial Eye Protection: **AS1336** and **AS/NZS 1337**, Occupational Protective Footwear: **AS/NZS2210**.

| SWA Exposure Limits | TWA (mg/m³) | STEL (mg/m³) |
|----------------------------|-------------------------------|--------------------------------|
| N-Methyl-2-pyrrolidone | 103 | 309 |

The ADI for Oxyfluorfen is set at 0.025mg/kg/day. The corresponding NOEL is set at 2.5mg/kg/day. ADI means Acceptable Daily Intake and NOEL means No-observable-effect-level. Values taken from Australian ADI List, Sept 2011.

Ventilation: This product should only be used in a well ventilated area. If natural ventilation is inadequate, use of a fan is suggested.

Eye Protection: Protective glasses or goggles should be worn when this product is being used. Failure to protect your eyes may cause them harm. Emergency eye wash facilities are also recommended in an area close to where this product is being used.

Skin Protection: Prevent skin contact by wearing impervious gloves, clothes and, preferably, apron. Make sure that all skin areas are covered. See below for suitable material types.

Protective Material Types: We suggest that protective clothing be made from the following materials: butyl.

Respirator: Usually, no respirator is necessary when using this product. However, if you have any doubts consult the Australian Standard mentioned above. Otherwise, not normally necessary.

Eyebaths or eyewash stations and safety deluge showers should be provided near to where this product is being used.

Section 9 - Physical and Chemical Properties:

| | |
|-------------------------------------------|--------------------------------------------------|
| Physical Description & colour: | Clear, dark amber liquid. |
| Odour: | Aromatic, fragrant floral odour. |
| Boiling Point: | Not available. |
| Freezing/Melting Point: | No specific data. Liquid at normal temperatures. |
| Volatiles: | No specific data. Expected to be low at 100°C. |
| Vapour Pressure: | Less than 0.0132 kPa at 20°C |
| Vapour Density: | No data. |
| Specific Gravity: | Believed to be about 1.08 at 20°C |
| Water Solubility: | Emulsifiable. |

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| pH: | No data. |
| Volatility: | No data. |
| Odour Threshold: | No data. |
| Evaporation Rate: | No data. |
| Coeff Oil/water distribution: | No data. |
| Autoignition temp: | No data. |

Section 10 - Stability and Reactivity

Reactivity: This product is unlikely to react or decompose under normal storage conditions. However, if you have any doubts, contact the supplier for advice on shelf life properties.

Conditions to Avoid: This product should be kept in a cool place, preferably below 30°C. Keep containers and surrounding areas well ventilated. Keep away from sources of sparks or ignition. Protect this product from light.

Incompatibilities: strong oxidising agents.

Fire Decomposition: Carbon dioxide, and if combustion is incomplete, carbon monoxide and smoke. Nitrogen and its compounds, and under some circumstances, oxides of nitrogen. Occasionally hydrogen cyanide gas. Minor quantities of hydrogen chloride gas, other compounds of chlorine and hydrogen fluoride gas and other compounds of fluorine. Water. Carbon monoxide poisoning produces headache, weakness, nausea, dizziness, confusion, dimness of vision, disturbance of judgment, and unconsciousness followed by coma and death. Hydrogen cyanide poisoning signs and symptoms are weakness, dizziness, headache, nausea, vomiting, coma, convulsions, and death. Death results from respiratory arrest. Hydrogen cyanide gas acts very rapidly; symptoms and death can both occur quickly.

Polymerisation: This product is unlikely to undergo polymerisation processes.

Section 11 - Toxicological Information

Toxicity: Acute toxicity: Oxyfluorfen is practically nontoxic by ingestion, with reported oral LD₅₀ values of 5000 mg/kg in both rats and dogs, and 2700 to 5000 mg/kg in mice. The dermal LD₅₀ is greater than 5000 mg/kg in both rats and rabbits, also indicating slight toxicity by this route. It causes no skin irritation in rabbits, no skin sensitization in guinea pigs, and moderate eye irritation in rabbits. However, some formulated products may show severe skin and eye irritant properties, and may be skin sensitizers. The 4-hour inhalation LC₅₀ for the technical product is not available, but that for a formulated product is greater than 22.64 mg/L, indicating practically no toxicity via this route.

Chronic toxicity: Effects on the liver have been observed in long-term feeding studies with rats, mice, and dogs.

Reproductive effects: In a developmental study with rats given doses of 10, 100, or 1000 mg/kg/day by gavage, decreased implantation, increased resorption, and lower foetal survival was seen at the 1000 mg/kg level. Toxic effects on the mothers were also seen at this dose. At 5 mg/kg/day, there was decreased survival of foetuses and decreased maternal and foetal weights. It does not appear likely that Oxyfluorfen will cause reproductive effects in humans at likely levels of exposure.

Teratogenic effects: In a developmental study with rabbits, 30 mg/kg/day, the highest dose tested, produced an increase in fused sternal bones in the foetuses as well as toxic effects on the mothers. These data suggest Oxyfluorfen may have teratogenic effects, but only at very high doses.

Mutagenic effects: Mutagenicity tests on rats, mice and on bacterial cell cultures have produced mixed results. However, unscheduled DNA synthesis assays have been negative. Due to the conflicting results, it is not possible to determine the mutagenic potential of Oxyfluorfen.

Carcinogenic effects: In a 20-month study with mice fed 0.3, 3, or 30 mg/kg/day, doses at and above 3 mg/kg/day produced non-significant increases in both benign and malignant liver tumors in male mice. No increased tumor formation was seen in female mice at any dose. No carcinogenic effects were observed in a 23-year study with rats fed doses 2 mg/kg/day, nor in dogs at doses of 3 mg/kg/day. These data suggest that Oxyfluorfen is not carcinogenic.

Organ toxicity: The liver appears to be the main target organ, based on long-term feeding studies.

Fate in humans and animals: Because Oxyfluorfen is highly hydrophobic, it may have the potential to bioconcentrate in animal fatty tissues.

Section 12 - Ecological Information

Effects on birds: Oxyfluorfen is practically nontoxic to birds; the reported oral LD₅₀ values are greater than 2200 mg/kg in bobwhite quail, and greater than 4000 mg/kg in mallard duck. The dietary 8-day dietary LC₅₀ values are greater than 5000 ppm in bobwhite quail, and 4000 ppm in mallard ducks. Dietary concentrations as high as 100 ppm had no effect on reproduction in mallards or bobwhite quail.

Effects on aquatic organisms: Oxyfluorfen is highly toxic to aquatic invertebrates, freshwater clams, oysters, aquatic plants, and fish. The reported 96-hour LC₅₀ values are 200 µg/L in bluegill sunfish, 410 µg/L in rainbow trout, 400 µg/L in channel catfish, 150 µg/L in fathead minnow, and 32 µg/L in grass shrimp and oysters. Its 96-hour LC₅₀ in freshwater clams is 10 µg/L. The 96-hour LC₅₀ for the product Goal 2E in *Daphnia magna*, a small freshwater crustacean, is 1500 µg/L. Oxyfluorfen accumulated up to 13 mg/kg (13,000 µg/kg) in bluegill sunfish exposed to 10

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µg/L for 40 days. This represents a bioconcentration factor (BCF) of 1300. The BCF in channel catfish was 700 to 5000 in one 30-day study. These results indicate a low to moderate potential for bioaccumulation in aquatic species.

Effects on other organisms: Oxyfluorfen is nontoxic to honeybees, with a reported oral LC₅₀ of greater than 10,000 ppm.

Environmental Fate:

Breakdown in soil and groundwater: Oxyfluorfen is moderately persistent in most soil environments, with a representative field half-life of about 30 to 40 days. Oxyfluorfen is not subject to microbial degradation or hydrolysis. The main mechanism of degradation in soils may be photodegradation and evaporation/codistillation in moist soils. In laboratory studies, its soil half-life was 6 months, indicating very low rates of microbial degradation. Oxyfluorfen is very well-sorbed to most soils. Soil binding is highest in soils with high organic matter and clay content. Once Oxyfluorfen is adsorbed to soil particles, it is not readily removed. It is practically insoluble in water, and therefore is unlikely to be appreciably mobile in most instances, unless the sorptive capacity of the soil is exceeded. Oxyfluorfen did not leach below 10cm in any soil except sand.

Breakdown in water: In water, Oxyfluorfen is rapidly decomposed by light. Because Oxyfluorfen is nearly insoluble in water and has a tendency to adsorb to soil, it will be sorbed to suspended particles or sediments.

Breakdown in vegetation: There is very little movement of Oxyfluorfen within treated plants. It is not readily metabolized by plants, but since it is not readily taken up by roots, residues in plants are generally very low. Residues of Oxyfluorfen accumulated in carrots and oats grown on previously treated fields, but not in cotton or lettuce.

Section 13 - Disposal Considerations

Disposal: Instructions concerning the disposal of this product and its containers are given on the registered label. These should be carefully followed. Special help is available for the disposal of Agricultural Chemicals. The product label will give general advice regarding disposal of small quantities, and how to cleanse containers. However, for help with the collection of unwanted rural chemicals, contact ChemClear 1800 008 182 <http://www.chemclear.com.au/> and for help with the disposal of empty drums, contact DrumMuster <http://www.drummuster.com.au/> where you will find contact details for your area.

Section 14 - Transport Information

Not subject to the ADG Code when transported by Road or Rail in Australia, in packages 500kg(L) or less; or IBCs, but classed as Dangerous by IATA and IMDG when carried by Air or Sea transport (see details below).

ADG Code: 3082, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.

Hazchem Code: •3Z

Special Provisions: 179, 274, AU01

Limited quantities: ADG 7 specifies a Limited Quantity value of 5 L for this class of product.

Dangerous Goods Class: Class 9: Miscellaneous Dangerous Goods.

Packaging Group: III

Packaging Method: P001, IBC03, LP01

Class 9 Miscellaneous Dangerous Goods shall not be loaded in the same vehicle or packed in the same freight container with Dangerous Goods of Class 1 (Explosives).

Section 15 - Regulatory Information

AICS: All of the significant ingredients in this product are compliant with NICNAS regulations.

Section 16 - Other Information

Much of the Information in this MSDS came from Extoxnet, a Pesticide Information Project of Cooperative Extension Offices of Cornell University, Oregon State University, the University of Idaho, and the University of California at Davis and the Institute for Environmental Toxicology, Michigan State University.

This MSDS contains only safety-related information. For other data see product literature.

Acronyms:

| | |
|-----------------------|---------------------------------------------------------------------------------------------------------------------|
| ADG Code | Australian Code for the Transport of Dangerous Goods by Road and Rail, 7th Edition |
| AICS | Australian Inventory of Chemical Substances |
| CAS number | Chemical Abstracts Service Registry Number |
| Hazchem Number | Emergency action code of numbers and letters that provide information to emergency services especially firefighters |
| IARC | International Agency for Research on Cancer |

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| SWA | Safe Work Australia, formerly ASCC and NOHSC |
| NOS | Not otherwise specified |
| NTP | National Toxicology Program (USA) |
| R-Phrase | Risk Phrase |
| SUSMP | Standard for the Uniform Scheduling of Medicines & Poisons |
| UN Number | United Nations Number |

Contact Points:

Call Adama on (02)9431 7800

Fax: (02)9431 7700 and ask for the technical manager.

Police and Fire Brigade:

Dial 000

Emergency contact:

1800 024 973 (24 hours)

If ineffective:

**Dial Poisons Information Centre
(13 1126 from anywhere in Australia)**

The information contained in this Material Safety Data Sheet is provided in good faith and is believed to be correct at the date hereof. However, it is expected that individuals receiving the information will exercise their independent judgement in determining its appropriateness for a particular purpose. Adama Australia Pty Ltd makes no representation as to the accuracy or comprehensiveness of the information and to the full extent allowed by law excludes all liability whatsoever, whether with respect to negligence or otherwise, for any loss or damage arising from or connection with the supply or use of the information in this Material Safety Data Sheet.

Please read all labels carefully before using product.

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