

Material Safety Data Sheet

DOW AGROSCIENCES CANADA INC.

Product name: TANDEM™ A Herbicide

Issue Date: 03/08/2016

Print Date: 03/08/2016

DOW AGROSCIENCES CANADA INC. encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. PRODUCT AND COMPANY IDENTIFICATION

Product name: TANDEM™ A Herbicide

Recommended use of the chemical and restrictions on use

Identified uses: End use herbicide product

COMPANY IDENTIFICATION

DOW AGROSCIENCES CANADA INC.
2100 450 1ST STREET SW
CALGARY AB T2P 5H1
CANADA

For MSDS Updates and Product Information: 800-667-3852

Prepared by: Prepared for use in Canada by EH&S, Hazard Communications.

Revision Date: 03/08/2016

Print Date: 03/08/2016

Customer Information Number:

800-667-3852
solutions@dow.com

EMERGENCY TELEPHONE NUMBER

24-Hour Emergency Contact: 613-996-6666

Local Emergency Contact: 613-996-6666

2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance

Physical state Liquid.

Color Brown

Odor pungent

Hazard Summary**WARNING!!**

May cause allergic skin reaction.
May cause eye irritation.
May cause central nervous system effects.
May cause anesthetic effects.
May cause respiratory tract irritation.
Aspiration hazard. Can enter lungs and cause damage.
Isolate area.
Keep upwind of spill.
Toxic fumes may be released in fire situations.
Suspect cancer hazard. May cause cancer.

Potential Health Effects

Eyes: May cause severe eye irritation.

May cause corneal injury.

May cause permanent impairment of vision.

Vapor may cause eye irritation experienced as mild discomfort and redness.

Skin: Brief contact may cause slight skin irritation with local redness.

May cause drying and flaking of the skin.

Prolonged skin contact is unlikely to result in absorption of harmful amounts.

For the active ingredient(s):

Has caused allergic skin reactions when tested in guinea pigs.

Inhalation: Prolonged excessive exposure to mist may cause adverse effects.

Excessive exposure may cause irritation to upper respiratory tract (nose and throat) and lungs.

May cause central nervous system effects.

Symptoms of excessive exposure may be anesthetic or narcotic effects; dizziness and drowsiness may be observed.

Signs and symptoms of excessive exposure may include:

Nausea and/or vomiting.

Ingestion: Very low toxicity if swallowed.

Harmful effects not anticipated from swallowing small amounts.

May be fatal if swallowed and enters airways.

Chronic Exposure: For the active ingredient(s):

In animals, effects have been reported on the following organs:

Bone marrow.

Kidney.

Liver.

Thymus.

Thyroid.

Bladder.

Contains naphthalene which has caused cancer in some laboratory animals.

In humans, there is limited evidence of cancer in workers involved in naphthalene production. Limited oral studies in rats were negative.

3. COMPOSITION/INFORMATION ON INGREDIENTS

This product is a mixture.

Component	CASRN	Weight percent
Pyroxsulam	422556-08-9	2.88%
Cloquintocet-mexyl	99607-70-2	8.64%
Naphthalene	91-20-3	>= 0.1 - <= 0.7 %
Balance	Not available	>= 87.76 - <= 88.36 %

4. FIRST AID MEASURES

Description of first aid measures

General advice: First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.

Inhalation: Move person to fresh air. If person is not breathing, call an emergency responder or ambulance, then give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask etc). Call a poison control center or doctor for treatment advice. If breathing is difficult, oxygen should be administered by qualified personnel.

Skin contact: Take off contaminated clothing. Wash skin with soap and plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice. Wash clothing before reuse. Shoes and other leather items which cannot be decontaminated should be disposed of properly. Suitable emergency safety shower facility should be available in work area.

Eye contact: Hold eyes open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eyes. Call a poison control center or doctor for treatment advice. Suitable emergency eye wash facility should be immediately available.

Ingestion: Immediately call a poison control center or doctor. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give any liquid to the person. Do not give anything by mouth to an unconscious person.

Most important symptoms and effects, both acute and delayed: Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), any additional important symptoms and effects are described in Section 11: Toxicology Information.

Indication of any immediate medical attention and special treatment needed

Notes to physician: Maintain adequate ventilation and oxygenation of the patient. May cause asthma-like (reactive airways) symptoms. Bronchodilators, expectorants, antitussives and corticosteroids may be of help. The decision of whether to induce vomiting or not should be made by a physician. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient. Have the Safety Data Sheet, and if available, the product container or label

with you when calling a poison control center or doctor, or going for treatment. Repeated excessive exposure may aggravate preexisting lung disease. Skin contact may aggravate preexisting dermatitis.

5. FIREFIGHTING MEASURES

Suitable extinguishing media: Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. General purpose synthetic foams (including AFFF type) or protein foams are preferred if available. Alcohol resistant foams (ATC type) may function.

Unsuitable extinguishing media: Do not use direct water stream. May spread fire.

Special hazards arising from the substance or mixture

Hazardous combustion products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Sulfur oxides. Nitrogen oxides. Hydrogen fluoride. Hydrogen chloride. Carbon monoxide. Carbon dioxide.

Unusual Fire and Explosion Hazards: Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.

Advice for firefighters

Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Consider feasibility of a controlled burn to minimize environment damage. Foam fire extinguishing system is preferred because uncontrolled water can spread possible contamination. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Do not use direct water stream. May spread fire. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Contain fire water run-off if possible. Fire water run-off, if not contained, may cause environmental damage. Review the "Accidental Release Measures" and the "Ecological Information" sections of this (M)SDS.

Special protective equipment for firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). Avoid contact with this material during fire fighting operations. If contact is likely, change to full chemical resistant fire fighting clothing with self-contained breathing apparatus. If this is not available, wear full chemical resistant clothing with self-contained breathing apparatus and fight fire from a remote location. For protective equipment in post-fire or non-fire clean-up situations, refer to the relevant sections.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: Isolate area. Keep unnecessary and unprotected personnel from entering the area. Refer to section 7, Handling, for additional precautionary measures. Keep upwind of spill. Ventilate area of leak or spill. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

Environmental precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

Methods and materials for containment and cleaning up: Contain spilled material if possible. Small spills: Absorb with materials such as: Clay. Dirt. Sand. Sweep up. Collect in suitable and properly labeled containers. Large spills: Contact Dow AgroSciences for clean-up assistance.

7. HANDLING AND STORAGE

Precautions for safe handling: Keep out of reach of children. Do not swallow. Avoid breathing vapor or mist. Avoid contact with eyes, skin, and clothing. Use with adequate ventilation. Wash thoroughly after handling. Keep container closed.

Conditions for safe storage: Store in a dry place. Store in original container. Keep container tightly closed when not in use. Do not store near food, foodstuffs, drugs or potable water supplies.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure limits are listed below, if they exist.

Component	Regulation	Type of listing	Value/Notation
Pyroxsulam	Dow IHG	TWA	5 mg/m3
	Dow IHG	TWA	Skin Sensitizer
Naphthalene	ACGIH	TWA	10 ppm
	CA AB OEL	TWA	52 mg/m3 10 ppm
	CA AB OEL	STEL	79 mg/m3 15 ppm
	CA BC OEL	TWA	10 ppm
	CA BC OEL	STEL	15 ppm
	CA QC OEL	TWAEV	52 mg/m3 10 ppm
	CA QC OEL	STEV	79 mg/m3 15 ppm

Consult local authorities for recommended exposure limits.

RECOMMENDATIONS IN THIS SECTION ARE FOR MANUFACTURING, COMMERCIAL BLENDING AND PACKAGING WORKERS. APPLICATORS AND HANDLERS SHOULD SEE THE PRODUCT LABEL FOR PROPER PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING.

Exposure controls

Engineering controls: Use engineering controls to maintain airborne level below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, use only with adequate ventilation. Local exhaust ventilation may be necessary for some operations.

Individual protection measures

Eye/face protection: Use chemical goggles. If exposure causes eye discomfort, use a full-face respirator.

Skin protection

Hand protection: Use gloves chemically resistant to this material. Examples of preferred glove barrier materials include: Chlorinated polyethylene. Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Viton. Examples of acceptable glove barrier materials include: Butyl rubber. Natural rubber ("latex"). Polyvinyl chloride ("PVC" or "vinyl"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements

(cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Other protection: Use protective clothing chemically resistant to this material.

Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task.

Respiratory protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, use an approved respirator. Selection of air-purifying or positive-pressure supplied-air will depend on the specific operation and the potential airborne concentration of the material. For emergency conditions, use an approved positive-pressure self-contained breathing apparatus.

The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Physical state	Liquid.
Color	Brown
Odor	pungent
Odor Threshold	No test data available
pH	5.18 <i>pH Electrode</i>
Melting point/range	Not applicable
Freezing point	No test data available
Boiling point (760 mmHg)	No test data available
Flash point	closed cup > 100 °C <i>Closed Cup</i>
Evaporation Rate (Butyl Acetate = 1)	No data available
Flammability (solid, gas)	No data available
Lower explosion limit	No test data available
Upper explosion limit	No test data available
Vapor Pressure	No test data available
Relative Vapor Density (air = 1)	No test data available
Relative Density (water = 1)	No data available
Water solubility	No test data available
Partition coefficient: n-octanol/water	No data available
Auto-ignition temperature	No test data available
Decomposition temperature	No test data available
Kinematic Viscosity	No data available
Explosive properties	No data available
Oxidizing properties	No data available
Liquid Density	1.04 g/cm ³ at 20 °C <i>Digital density meter</i>
Molecular weight	No data available

NOTE: The physical data presented above are typical values and should not be construed as a specification.

10. STABILITY AND REACTIVITY

Reactivity: No dangerous reaction known under conditions of normal use.

Chemical stability: Stable under recommended storage conditions. See Storage, Section 7.

Possibility of hazardous reactions: Polymerization will not occur.

Conditions to avoid: Exposure to elevated temperatures can cause product to decompose. Generation of gas during decomposition can cause pressure in closed systems.

Incompatible materials: Avoid contact with oxidizing materials.

Hazardous decomposition products: Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Hydrocarbons. Hydrogen chloride. Hydrogen fluoride. Nitrogen oxides. Sulfur oxides. Toxic gases are released during decomposition.

11. TOXICOLOGICAL INFORMATION

Toxicological information appears in this section when such data is available.

Acute toxicity

Acute oral toxicity

Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts.

As product: Single dose oral LD50 has not been determined.

Based on information for component(s):

LD50, Rat, > 5,000 mg/kg

Acute dermal toxicity

Prolonged skin contact is unlikely to result in absorption of harmful amounts.

As product: The dermal LD50 has not been determined.

Based on information for component(s):

LD50, Rat, > 5,000 mg/kg

Acute inhalation toxicity

Prolonged excessive exposure to mist may cause adverse effects. Excessive exposure may cause irritation to upper respiratory tract (nose and throat) and lungs. May cause central nervous system effects. Symptoms of excessive exposure may be anesthetic or narcotic effects; dizziness and drowsiness may be observed. Signs and symptoms of excessive exposure may include: Nausea and/or vomiting.

As product: The LC50 has not been determined.

Skin corrosion/irritation

Brief contact may cause slight skin irritation with local redness.
May cause drying and flaking of the skin.

Serious eye damage/eye irritation

May cause severe eye irritation.
May cause corneal injury.
May cause permanent impairment of vision.
Vapor may cause eye irritation experienced as mild discomfort and redness.

Sensitization

For the active ingredient(s):
Has caused allergic skin reactions when tested in guinea pigs.

For respiratory sensitization:
No relevant information found.

Specific Target Organ Systemic Toxicity (Single Exposure)

Evaluation of available data suggests that this material is not an STOT-SE toxicant.

Specific Target Organ Systemic Toxicity (Repeated Exposure)

For the active ingredient(s):
In animals, effects have been reported on the following organs:
Bone marrow.
Kidney.
Liver.
Thymus.
Thyroid.
Bladder.

For the solvent(s):
Based on available data, repeated exposures are not anticipated to cause significant adverse effects.

Carcinogenicity

For the active ingredient(s): Did not cause cancer in laboratory animals.

Contains naphthalene which has caused cancer in some laboratory animals. In humans, there is limited evidence of cancer in workers involved in naphthalene production. Limited oral studies in rats were negative.

Teratogenicity

For the active ingredient(s): For the solvent(s): Did not cause birth defects or any other fetal effects in laboratory animals.

Reproductive toxicity

In animal studies, active ingredient did not interfere with reproduction.

Mutagenicity

For the active ingredient(s): In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were negative.

Aspiration Hazard

May be fatal if swallowed and enters airways.

COMPONENTS INFLUENCING TOXICOLOGY:

Pyroxsulam

Acute inhalation toxicity

LC50, Rat, 4 Hour, Aerosol, > 5.12 mg/l No deaths occurred at this concentration.

Cloquintocet-mexyl

Acute inhalation toxicity

LC50, Rat, male and female, 4 Hour, dust/mist, > 5.42 mg/l

Balance

Acute inhalation toxicity

The LC50 has not been determined.

12. ECOLOGICAL INFORMATION

Ecotoxicological information appears in this section when such data is available.

Toxicity

Pyroxsulam

Acute toxicity to fish

Material is very highly toxic to aquatic organisms on an acute basis (LC50/EC50 <0.1 mg/L in the most sensitive species).

LC50, Oncorhynchus mykiss (rainbow trout), static test, 96 Hour, > 87.0 mg/l, OECD Test Guideline 203 or Equivalent

Acute toxicity to aquatic invertebrates

EC50, Daphnia magna (Water flea), static test, 48 Hour, > 100 mg/l, OECD Test Guideline 202 or Equivalent

Acute toxicity to algae/aquatic plants

EC50, Lemna minor (duckweed), 7 d, Biomass, 0.00257 mg/l, OECD 221.

Toxicity to bacteria

EC50, activated sludge, 3 Hour, > 1,000 mg/l

Chronic toxicity to fish

NOEC, Pimephales promelas (fathead minnow), flow-through test, 40 d, survival, 3.2 - 10.1 mg/l

Chronic toxicity to aquatic invertebrates

NOEC, Daphnia magna (Water flea), static test, 21 d, survival, 10.4 mg/l

Toxicity to Above Ground Organisms

Material is practically non-toxic to birds on an acute basis (LD50 > 2000 mg/kg).

Material is practically non-toxic to birds on a dietary basis (LC50 > 5000 ppm).

LC50, Colinus virginianus (Bobwhite quail), 8 d, > 5000mg/kg diet.

LD50, Colinus virginianus (Bobwhite quail), > 2000mg/kg bodyweight.

oral LD50, Apis mellifera (bees), 48 Hour, > 107.4micrograms/bee

contact LD50, Apis mellifera (bees), 48 Hour, > 100micrograms/bee

Toxicity to soil-dwelling organisms

LC50, Eisenia fetida (earthworms), 14 d, > 10,000 mg/kg

Cloquintocet-mexyl**Acute toxicity to fish**

Material is highly toxic to aquatic organisms on an acute basis (LC50/EC50 between 0.1 and 1 mg/L in the most sensitive species tested).

As the ester active substance.

LC50, Oncorhynchus mykiss (rainbow trout), flow-through test, 96 Hour, > 0.97 mg/l, Method Not Specified.

Acute toxicity to aquatic invertebrates

As the ester active substance.

EC50, Daphnia magna (Water flea), flow-through test, 48 Hour, > 0.82 mg/l, Method Not Specified.

Acute toxicity to algae/aquatic plants

As the ester active substance.

EbC50, alga Scenedesmus sp., 96 Hour, Biomass, 0.63 mg/l, Method Not Specified.

As the ester active substance.

EbC50, Lemna minor (duckweed), 14 d, Biomass, > 0.42 mg/l, Method Not Specified.

Toxicity to Above Ground Organisms

Material is practically non-toxic to birds on an acute basis (LD50 > 2000 mg/kg).

Material is practically non-toxic to birds on a dietary basis (LC50 > 5000 ppm).

oral LD50, Anas platyrhynchos (Mallard duck), > 2000mg/kg bodyweight.

dietary LC50, Anas platyrhynchos (Mallard duck), 8 d, > 5200mg/kg diet.

oral LD50, Apis mellifera (bees), 48 Hour, > 100micrograms/bee

contact LD50, Apis mellifera (bees), 48 Hour, > 100micrograms/bee

Toxicity to soil-dwelling organisms

LC50, Eisenia fetida (earthworms), > 1,000 mg/kg

Balance**Acute toxicity to fish**

No relevant data found.

Persistence and degradability**Pyroxsulam**

Biodegradability: Based on stringent OECD test guidelines, this material cannot be considered as readily biodegradable; however, these results do not necessarily mean that the material is not biodegradable under environmental conditions.

10-day Window: Fail

Biodegradation: 20 - 30 %

Exposure time: 28 d

Method: OECD Test Guideline 301B or Equivalent

Cloquintocet-mexyl

Biodegradability: No relevant data found.

Balance

Biodegradability: No relevant data found.

Bioaccumulative potential

Pyroxsulam

Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).

Partition coefficient: n-octanol/water(log Pow): -1.01 Measured

Cloquintocet-mexyl

Bioaccumulation: Bioconcentration potential is moderate (BCF between 100 and 3000 or Log Pow between 3 and 5).

Partition coefficient: n-octanol/water(log Pow): 5.3 Estimated.

Bioconcentration factor (BCF): 122 - 621 Fish

Balance

Bioaccumulation: No relevant data found.

Mobility in soil

Pyroxsulam

Potential for mobility in soil is very high (Koc between 0 and 50).

Partition coefficient(Koc): <= 42 Estimated.

Cloquintocet-mexyl

Expected to be relatively immobile in soil (Koc > 5000).

Partition coefficient(Koc): 38070 Estimated.

Balance

No relevant data found.

13. DISPOSAL CONSIDERATIONS

Disposal methods: If wastes and/or containers cannot be disposed of according to the product label directions, disposal of this material must be in accordance with your local or area regulatory authorities. This information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations. If the material as supplied becomes a waste, follow all applicable regional, national and local laws.

14. TRANSPORT INFORMATION

TDG

Proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.(PYROXSULAM, Naphthalene)
UN number	UN 3082
Class	9
Packing group	III
Marine pollutant	PYROXSULAM, Naphthalene

Classification for SEA transport (IMO-IMDG):

Proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.(PYROXSULAM, Naphthalene)
UN number	UN 3082
Class	9
Packing group	III
Marine pollutant	PYROXSULAM, Naphthalene
Transport in bulk according to Annex I or II of MARPOL 73/78 and the IBC or IGC Code	Consult IMO regulations before transporting ocean bulk

Classification for AIR transport (IATA/ICAO):

Proper shipping name	Environmentally hazardous substance, liquid, n.o.s.(PYROXSULAM, Naphthalene)
UN number	UN 3082
Class	9
Packing group	III

Further information:

NOT REGULATED PER TDG EXEMPTION 1.45.1 FOR ROAD OR RAIL

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. REGULATORY INFORMATION

Hazardous Products Act Information: CPR Compliance

This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

Hazardous Products Act Information: WHMIS Classification

This product is exempt under WHMIS.

National Fire Code of Canada

Not applicable

Canadian Domestic Substances List (DSL) (DSL)

This product contains chemical substance(s) exempt from CEPA DSL Inventory requirements. It is regulated as a pesticide subject to Pest Control Products Act (PCPA) requirements.

Pest Control Products Act Registration Number: 29985

16. OTHER INFORMATION

Hazard Rating System**NFPA**

Health	Fire	Reactivity
2	1	1

Revision

Identification Number: 101216332 / A215 / Issue Date: 03/08/2016 / Version: 2.1

DAS Code: GF-2541

Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

ACGIH	USA. ACGIH Threshold Limit Values (TLV)
CA AB OEL	Canada. Alberta, Occupational Health and Safety Code (table 2: OEL)
CA BC OEL	Canada. British Columbia OEL
CA QC OEL	Québec. Regulation respecting occupational health and safety, Schedule 1, Part 1: Permissible exposure values for airborne contaminants
Dow IHG	Dow Industrial Hygiene Guideline
STEL	short-term exposure limit
STEV	Short-term exposure value
TWA	8-hour time weighted average
TWAEV	Time-weighted average exposure value

Information Source and References

This SDS is prepared by Product Regulatory Services and Hazard Communications Groups from information supplied by internal references within our company.

DOW AGROSCIENCES CANADA INC. urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

Material Safety Data Sheet

DOW AGROSCIENCES CANADA INC.

Product name: Tandem B Herbicide

Issue Date: 07/19/2016

DOW AGROSCIENCES CANADA INC. encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. PRODUCT AND COMPANY IDENTIFICATION

Product name: Tandem B Herbicide

Recommended use of the chemical and restrictions on use

Identified uses: End use herbicide product

COMPANY IDENTIFICATION

DOW AGROSCIENCES CANADA INC.
#2400, 215 - 2ND STREET S.W.
CALGARY AB T2P 1M4
CANADA

For MSDS Updates and Product Information: 800-667-3852

Prepared by: Prepared for use in Canada by EH&S, Hazard Communications.

Revision Date: 07/19/2016

Customer Information Number:

800-667-3852 solutions@dow.com

EMERGENCY TELEPHONE NUMBER

24-Hour Emergency Contact: 613-996-6666

Local Emergency Contact: 613-996-6666

2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance

Physical state Liquid

Color Yellow to brown

Odor Spicy

Hazard Summary

WARNING!!

May cause allergic skin reaction.

May cause eye irritation.

Isolate area.

Toxic fumes may be released in fire situations.

Potential Health Effects

Eyes: May cause moderate eye irritation.
May cause slight corneal injury.

Skin: Has demonstrated the potential for contact allergy in mice.
Prolonged skin contact is unlikely to result in absorption of harmful amounts.
Brief contact may cause slight skin irritation with local redness.
May cause drying and flaking of the skin.

Inhalation: No adverse effects are anticipated from single exposure to mist.
Mist may cause irritation of upper respiratory tract (nose and throat).

Ingestion: Very low toxicity if swallowed.
Harmful effects not anticipated from swallowing small amounts.

Chronic Exposure: For the active ingredient(s):
Has been toxic to the fetus in laboratory animals at doses toxic to the mother.
Based on information for component(s):
In animals, effects have been reported on the following organs:
Kidney.

3. COMPOSITION/INFORMATION ON INGREDIENTS

This product is a mixture.

Component	CASRN	Weight percent
Fluroxypyr 1-methylheptyl ester	81406-37-3	45.52%
Heavy aromatic naphtha	64742-94-5	>= 0.7 - <= 2.6 %
N-Methyl-2-pyrrolidone	872-50-4	0.1%
Balance	Not available	>= 51.8 - <= 53.7 %

4. FIRST AID MEASURES

Description of first aid measures

General advice: First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.

Inhalation: Move person to fresh air. If person is not breathing, call an emergency responder or ambulance, then give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask etc). Call a poison control center or doctor for treatment advice.

Skin contact: Take off contaminated clothing. Wash skin with soap and plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice. Wash clothing before reuse. Shoes and other leather items which cannot be decontaminated should be disposed of properly.

Eye contact: Hold eyes open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eyes. Call a poison control center or doctor for treatment advice. Suitable emergency eye wash facility should be available in work area.

Ingestion: No emergency medical treatment necessary.

Most important symptoms and effects, both acute and delayed: Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), any additional important symptoms and effects are described in Section 11: Toxicology Information.

Indication of any immediate medical attention and special treatment needed

Notes to physician: No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient. Have the Safety Data Sheet, and if available, the product container or label with you when calling a poison control center or doctor, or going for treatment. Skin contact may aggravate preexisting dermatitis.

5. FIREFIGHTING MEASURES

Suitable extinguishing media: Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective.

Unsuitable extinguishing media: Do not use direct water stream. May spread fire.

Special hazards arising from the substance or mixture

Hazardous combustion products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Nitrogen oxides. Hydrogen fluoride. Hydrogen chloride. Carbon monoxide. Carbon dioxide.

Unusual Fire and Explosion Hazards: Container may rupture from gas generation in a fire situation. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids. Dense smoke is produced when product burns.

Advice for firefighters

Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Consider feasibility of a controlled burn to minimize environment damage. Foam fire extinguishing system is preferred because uncontrolled water can spread possible contamination. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Fight fire from protected location or safe distance. Consider the use of unmanned hose holders or monitor nozzles. Immediately withdraw all personnel from the area in case of rising sound from venting safety device or discoloration of the container. Burning liquids may be extinguished by dilution with water. Do not use direct water stream. May spread fire. Move container from fire area if this is possible without hazard. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Contain fire water run-off if possible. Fire water run-off, if not contained, may cause environmental damage. Review the "Accidental Release Measures" and the "Ecological Information" sections of this (M)SDS.

Special protective equipment for firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). Avoid contact with this material during fire fighting operations. If contact is likely, change to full chemical resistant fire fighting clothing with self-contained breathing apparatus. If this is not available, wear full chemical resistant clothing with self-contained breathing apparatus and fight fire from a remote location. For protective equipment in post-fire or non-fire clean-up situations, refer to the relevant sections.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: Isolate area. Keep unnecessary and unprotected personnel from entering the area. Refer to section 7, Handling, for additional precautionary measures. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

Environmental precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

Methods and materials for containment and cleaning up: Contain spilled material if possible. Small spills: Absorb with materials such as: Clay. Dirt. Sand. Sweep up. Collect in suitable and properly labeled containers. Large spills: Contact Dow AgroSciences for clean-up assistance. See Section 13, Disposal Considerations, for additional information.

7. HANDLING AND STORAGE

Precautions for safe handling: Keep out of reach of children. Avoid prolonged or repeated contact with skin. Avoid contact with eyes, skin, and clothing. Do not swallow. Avoid breathing vapor or mist. Wash thoroughly after handling. Use with adequate ventilation. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

Conditions for safe storage: Store in a dry place. Store in original container. Keep container tightly closed when not in use. Do not store near food, foodstuffs, drugs or potable water supplies.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure limits are listed below, if they exist.

Component	Regulation	Type of listing	Value/Notation
Fluroxypyr 1-methylheptyl ester	Dow IHG	TWA	10 mg/m3
Heavy aromatic naphtha	Dow IHG	TWA	100 mg/m3
	Dow IHG	STEL	300 mg/m3
N-Methyl-2-pyrrolidone	US WEEL	TWA	10 ppm
	US WEEL	TWA	SKIN
	CA ON OEL	TWA	400 mg/m3
	US WEEL	TWA	SKIN

Consult local authorities for recommended exposure limits.

RECOMMENDATIONS IN THIS SECTION ARE FOR MANUFACTURING, COMMERCIAL BLENDING AND PACKAGING WORKERS. APPLICATORS AND HANDLERS SHOULD SEE THE PRODUCT LABEL FOR PROPER PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING.

Exposure controls

Engineering controls: Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations. Local exhaust ventilation may be necessary for some operations.

Individual protection measures

Eye/face protection: Use chemical goggles.

Skin protection

Hand protection: Use gloves chemically resistant to this material. Examples of preferred glove barrier materials include: Butyl rubber. Chlorinated polyethylene. Polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Examples of acceptable glove barrier materials include: Natural rubber ("latex"). Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Polyvinyl chloride ("PVC" or "vinyl"). Viton. NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Other protection: Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task.

Respiratory protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. In misty atmospheres, use an approved particulate respirator. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Physical state	Liquid
Color	Yellow to brown
Odor	Spicy
Odor Threshold	No test data available
pH	4.58 1% ASTM E70
Melting point/range	Not applicable
Freezing point	No test data available
Boiling point (760 mmHg)	No test data available
Flash point	closed cup > 100 °C ASTM D3278
Evaporation Rate (Butyl Acetate = 1)	No test data available
Flammability (solid, gas)	Not applicable to liquids
Lower explosion limit	No test data available
Upper explosion limit	No test data available
Vapor Pressure	No test data available
Relative Vapor Density (air = 1)	No test data available
Relative Density (water = 1)	1.05
Water solubility	emulsifiable
Partition coefficient: n-octanol/water	No data available
Auto-ignition temperature	358 °C EC Method A15
Decomposition temperature	No test data available
Dynamic Viscosity	28.2 mPa.s at 40 °C OECD 114
Kinematic Viscosity	No test data available

Explosive properties	No EEC A14
Oxidizing properties	No data available
Liquid Density	1.05 g/cm ³ at 20 °C OECD 109
Molecular weight	No test data available
Surface tension	32 mN/m at 25 °C EC Method A5

NOTE: The physical data presented above are typical values and should not be construed as a specification.

10. STABILITY AND REACTIVITY

Reactivity: No dangerous reaction known under conditions of normal use.

Chemical stability: Unstable at elevated temperatures.

Possibility of hazardous reactions: Polymerization will not occur.

Conditions to avoid: Exposure to elevated temperatures can cause product to decompose. Generation of gas during decomposition can cause pressure in closed systems.

Incompatible materials: None known.

Hazardous decomposition products: Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Hydrogen chloride. Hydrogen fluoride. Nitrogen oxides. Toxic gases are released during decomposition.

11. TOXICOLOGICAL INFORMATION

Toxicological information appears in this section when such data is available.

Acute toxicity

Acute oral toxicity

Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts.

As product:

LD50, Rat, female, > 5,000 mg/kg No deaths occurred at this concentration.

Acute dermal toxicity

Prolonged skin contact is unlikely to result in absorption of harmful amounts.

As product:

LD50, Rat, male and female, > 5,000 mg/kg No deaths occurred at this concentration.

Acute inhalation toxicity

No adverse effects are anticipated from single exposure to mist. Mist may cause irritation of upper respiratory tract (nose and throat).

LC50, Rat, male and female, 4 Hour, dust/mist, > 5.50 mg/l

Skin corrosion/irritation

Brief contact may cause slight skin irritation with local redness.

May cause drying and flaking of the skin.

Prolonged contact is essentially nonirritating to skin.

Serious eye damage/eye irritation

May cause moderate eye irritation.
May cause slight corneal injury.

Sensitization

As product:

Has demonstrated the potential for contact allergy in mice.

For respiratory sensitization:

No relevant data found.

Specific Target Organ Systemic Toxicity (Single Exposure)

May cause respiratory irritation.

Specific Target Organ Systemic Toxicity (Repeated Exposure)

For the active ingredient(s):

Based on available data, repeated exposures are not anticipated to cause significant adverse effects.

For the major component(s):

For similar material(s):

In animals, effects have been reported on the following organs:

Kidney.

For the minor component(s):

In animals, effects have been reported on the following organs:

Lung.

Gastrointestinal tract.

Thyroid.

Urinary tract.

Dose levels producing these effects were many times higher than any dose levels expected from exposure due to use.

Carcinogenicity

For similar active ingredient(s). Fluroxypyr-meptyl. Did not cause cancer in laboratory animals.

Teratogenicity

For the active ingredient(s): Has been toxic to the fetus in laboratory animals at doses toxic to the mother. Did not cause birth defects in laboratory animals.

Reproductive toxicity

For the active ingredient(s): In animal studies, did not interfere with reproduction.

Mutagenicity

As product: In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were negative.

Aspiration Hazard

Based on physical properties, not likely to be an aspiration hazard.

12. ECOLOGICAL INFORMATION

Ecotoxicological information appears in this section when such data is available.

Toxicity

Acute toxicity to fish

Material is highly toxic to aquatic organisms on an acute basis (LC50/EC50 between 0.1 and 1 mg/L in the most sensitive species tested).

LC50, Oncorhynchus mykiss (rainbow trout), flow-through test, 96 Hour, 14.3 mg/l, OECD Test Guideline 203

Acute toxicity to aquatic invertebrates

EC50, Daphnia magna (Water flea), static test, 48 Hour, 20 mg/l, OECD Test Guideline 202

Acute toxicity to algae/aquatic plants

ErC50, Pseudokirchneriella subcapitata (green algae), static test, 72 Hour, Growth rate inhibition, 9.6 mg/l, OECD Test Guideline 201

ErC50, Myriophyllum spicatum, static test, 14 d, 0.178 mg/l, OECD Test Guideline 201

NOEC, Myriophyllum spicatum, static test, 14 d, 0.0152 mg/l, OECD Test Guideline 201

Toxicity to Above Ground Organisms

Material is practically non-toxic to birds on an acute basis (LD50 > 2000 mg/kg).

oral LD50, Colinus virginianus (Bobwhite quail), > 2,250 mg/kg

Toxicity to soil-dwelling organisms

LC50, Eisenia fetida (earthworms), 14 d, survival, > 1,000 mg/kg

Persistence and degradability

Fluroxypyr 1-methylheptyl ester

Biodegradability: Material is not readily biodegradable according to OECD/EEC guidelines.

10-day Window: Fail

Biodegradation: 32 %

Exposure time: 28 d

Method: OECD Test Guideline 301D or Equivalent

Theoretical Oxygen Demand: 2.2 mg/mg

Stability in Water (1/2-life)

Hydrolysis, half-life, 454 d

Heavy aromatic naphtha

Biodegradability: Material is not readily biodegradable according to OECD/EEC guidelines.

N-Methyl-2-pyrrolidone

Biodegradability: Material is readily biodegradable. Passes OECD test(s) for ready biodegradability.

10-day Window: Pass

Biodegradation: 91 %

Exposure time: 28 d

Method: OECD Test Guideline 301B or Equivalent

10-day Window: Not applicable

Biodegradation: 73 %

Exposure time: 28 d

Method: OECD Test Guideline 301C or Equivalent

10-day Window: Not applicable

Biodegradation: > 90 %

Exposure time: 8 d

Method: OECD Test Guideline 302B or Equivalent

Theoretical Oxygen Demand: 2.58 mg/mg

Photodegradation**Test Type:** Half-life (indirect photolysis)**Sensitizer:** OH radicals**Atmospheric half-life:** 0.486 d**Method:** Estimated.**Balance****Biodegradability:** No relevant data found.**Bioaccumulative potential****Fluroxypyr 1-methylheptyl ester****Bioaccumulation:** Bioconcentration potential is low (BCF < 100 or Log Pow < 3).**Partition coefficient: n-octanol/water(log Pow):** 5.04 Measured**Bioconcentration factor (BCF):** 26 Oncorhynchus mykiss (rainbow trout) Measured**Heavy aromatic naphtha****Bioaccumulation:** For similar material(s): Bioconcentration potential is high (BCF > 3000 or Log Pow between 5 and 7).**N-Methyl-2-pyrrolidone****Bioaccumulation:** Bioconcentration potential is low (BCF < 100 or Log Pow < 3).**Partition coefficient: n-octanol/water(log Pow):** -0.38 Measured**Balance****Bioaccumulation:** No relevant data found.**Mobility in soil****Fluroxypyr 1-methylheptyl ester**

Expected to be relatively immobile in soil (Koc > 5000).

Partition coefficient (Koc): 6200 - 43000**Heavy aromatic naphtha**

No relevant data found.

N-Methyl-2-pyrrolidone

Potential for mobility in soil is very high (Koc between 0 and 50).

Given its very low Henry's constant, volatilization from natural bodies of water or moist soil is not expected to be an important fate process.

Partition coefficient (Koc): 21 Estimated.**Balance**

No relevant data found.

13. DISPOSAL CONSIDERATIONS

Disposal methods: If wastes and/or containers cannot be disposed of according to the product label directions, disposal of this material must be in accordance with your local or area regulatory authorities. This information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations. If the material as supplied becomes a waste, follow all applicable regional, national and local laws.

14. TRANSPORT INFORMATION

TDG

Proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.(Fluroxypyr)
UN number	UN 3082
Class	9
Packing group	III
Marine pollutant	Fluroxypyr

Classification for SEA transport (IMO-IMDG):

Proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.(Fluroxypyr)
UN number	UN 3082
Class	9
Packing group	III
Marine pollutant	Fluroxypyr
Transport in bulk according to Annex I or II of MARPOL 73/78 and the IBC or IGC Code	Consult IMO regulations before transporting ocean bulk

Classification for AIR transport (IATA/ICAO):

Proper shipping name	Environmentally hazardous substance, liquid, n.o.s.(Fluroxypyr)
UN number	UN 3082
Class	9
Packing group	III

Further information:

NOT REGULATED PER TDG EXEMPTION 1.45.1 FOR ROAD OR RAIL

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. REGULATORY INFORMATION

Hazardous Products Act Information: CPR Compliance

This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

Hazardous Products Act Information: WHMIS Classification

This product is exempt under WHMIS.

National Fire Code of Canada

Not applicable

Canadian Domestic Substances List (DSL) (DSL)

This product contains chemical substance(s) exempt from CEPA DSL Inventory requirements. It is regulated as a pesticide subject to Pest Control Products Act (PCPA) requirements.

Pest Control Products Act (PCPA) Registration Number: 29965

16. OTHER INFORMATION

Hazard Rating System**NFPA**

Health	Fire	Reactivity
1	1	1

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Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

CA ON OEL	Ontario Table of Occupational Exposure Limits made under the Occupational Health and Safety Act.
Dow IHG	Dow Industrial Hygiene Guideline
SKIN	Absorbed via skin
STEL	Short term exposure limit
TWA	Time weighted average
US WEEL	USA. Workplace Environmental Exposure Levels (WEEL)

Information Source and References

This SDS is prepared by Product Regulatory Services and Hazard Communications Groups from information supplied by internal references within our company.

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