WINFIELD UNITED

MATERIAL SAFETY DATA SHEET

Syngenta Canada Inc.
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In Case of Emergency, Call
1-800-327-8633 (FAST MED)

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MSDS prepared by:
Department of Regulatory & Biological Assessment
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SECTION – 1: PRODUCT IDENTIFICATION

Product Identifier: Craven® Formulation No.: A12872A
Registration Number: 32231 (Pest Control Products Act)
Chemical Class: Bipyridilium (dipyridilium) contact herbicide.

Active Ingredient (%): Diquat dibromide (39.5%) CAS No.: 85-00-7
Chemical Name: 6,7-dihydrodipyrido(1,2-a:2',1'-c)pyrazinediium dibromide.
Product Use: For potato vine killing, desiccation of pulse, oilseed and legume forage seed crops, weed control in vegetable and field crops, control of corn spurry in oats and weed control in non-crop land, and chemical mowing. Please refer to product label for further details.

SECTION – 2 : COMPOSITION/INFORMATION ON INGREDIENTS

Material	OSHA PEL	ACGIH TLV	Other	NTP/IARC/OSHA Carcinogen	WHMIS†
Diquat dibromide (39.5%)	Not Established	0.5 mg/m³ TWA (inhalable); 0.1 mg/m³ TWA (respirable), skin	0.5 mg/m³ TWA (0.5 total; 0.08 respirable)***	No	Not Established

*** Syngenta Occupational Exposure Limit (OEL)
† Material listed in Ingredient Disclosure List under Hazardous Products Act.

Ingredients not precisely identified are proprietary or non-hazardous. Values are not product specifications.

SECTION – 3: HAZARDS IDENTIFICATION

Symptoms of Acute Exposure

Harmful if swallowed or inhaled. Irritating to eyes and skin.

Hazardous Decomposition Products

Flammable hydrogen gas may be formed on contact with aluminum. See "Conditions to Avoid", Section 10. Can decompose at high temperatures forming toxic gases.

Physical Properties

Appearance: Dark Brown liquid.
Odour: Odourless.

Unusual Fire, Explosion and Reactivity Hazards

This product may form flammable and explosive hydrogen gas when in contact with aluminum. During a fire, irritating and possibly toxic gases may be generated by thermal decomposition or combustion.

Potential Health Effects

Irritation of the mouth, pharynx, esophagus and stomach can develop following ingestion. The degree of injury will depend on the amount absorbed from the gut. Symptoms following ingestion of diquat concentrate may initially include nausea, vomiting, abdominal pain and severe irritation of the mouth, throat and esophagus. These can be followed by kidney failure and other internal organ involvement.

This substance is considered slightly toxic by inhalation. The degree of injury will depend on the airborne concentration and duration of exposure. Diquat is a water-soluble salt which has no measurable vapour pressure. Therefore, inhalation hazard from diquat vapour is minimal. If the concentrate is spilled and allowed to stand, it can dry to a highly irritating dust. Symptoms of inhalation overexposure may include headache, nose bleed, sore throat and coughing.

This material is classified as "slightly toxic" by dermal absorption. The degree of injury will depend on the amount absorbed. Because diquat is an ionized compound, it has a slow rate of absorption through intact skin. Prolonged or repeated contact may result in skin damage, thus allowing more of the chemical to be absorbed. This could result in systemic poisoning as evidenced by injury to internal organs, primarily the kidneys. Short contact periods with human skin are not usually associated with skin irritation; repeated and/or prolonged contact can result in skin irritation. Repeated and/or prolonged contact may cause dermatitis.

This material may irritate human eyes following contact and could cause prolonged (weeks) impairment of vision. The degree of injury will depend on the amount of material that gets into the eye and the speed and thoroughness of the first aid treatment. Symptoms may include pain, tearing, swelling, redness, and blurred vision.

Relevant routes of exposure: Skin, eyes, mouth, lungs.

SECTION – 4: FIRST AID MEASURES

IF POISONING IS SUSPECTED, immediately contact the poison information centre, doctor or nearest hospital. Have the product container, label or Material Safety Data Sheet with you when calling Syngenta, a poison control center or doctor, or going for treatment. Tell the person contacted the complete product name, and the type and amount of exposure. Describe any symptoms and follow the advice given. Call the Syngenta Emergency Line [**1-800-327-8633** (**1-800- FASTMED**)], for further information.

EYE CONTACT:	Flush eyes with clean water, holding eyelids apart for a minimum of 15-20 minutes. Remove contact lenses, if present, after 5 minutes, then continue rinsing eye. Call Syngenta, a poison control center or doctor for treatment advice. Obtain medical attention immediately if irritation persists.
SKIN CONTACT:	Immediately remove contaminated clothing and wash skin, hair and fingernails thoroughly with soap and water. Flush skin with plenty of water for 15-20 minutes. Call Syngenta, a poison control centre or doctor for treatment advice.
INHALATION:	Move victim to fresh air. If not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth, if possible. Call Syngenta, a poison control centre or doctor for treatment advice.
INGESTION:	If swallowed, immediately contact Syngenta, a poison control centre, doctor or nearest hospital for treatment advice. Have person sip a glass of water if able to swallow. Do not give anything by mouth to an unconscious person. Do not induce vomiting unless directed by a physician or a poison control center. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer water.

NOTES TO PHYSICIAN:
To be effective, treatment for ingestion of the product must begin IMMEDIATELY. Treatment consists of binding the active ingredient, diquat, in the gut with suspensions of activated charcoal or bentonite clay, administration of cathartics to enhance elimination and removal of diquat from the blood by charcoal hemoperfusion or continuous hemodialysis.

SECTION – 5: FIRE FIGHTING MEASURES

Flash point and method: Not applicable.
Upper and lower flammable (explosive) limits in air: Not applicable.
Auto-ignition temperature: Not applicable.
Flammability: Not flammable.
Hazardous combustion products: Carbon dioxide, carbon monoxide and, irritating and/or toxic gases, vapours or smoke.
Conditions under which flammability could occur: Flammable hydrogen gas may be formed on contact with aluminum. See "Conditions to Avoid", Section 10. Keep fire exposed containers cool by spraying with water.
Extinguishing media: Use foam, carbon dioxide, dry powder or halon extinguishant. Wear full protective clothing and self-contained breathing apparatus. Evacuate nonessential personnel from the area to prevent human exposure to fire, smoke, fumes or products of combustion. Prevent use of contaminated buildings, area, and equipment until decontaminated. Water runoff can cause environmental damage. Contain run-off water with, for example, temporary earth barriers.
Sensitivity to explosion by mechanical impact: None known.
Sensitivity to explosion by static discharge: None known.

SECTION – 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions: Make sure all personnel involved in the spill cleanup follow good industrial hygiene practices. A small spill can be handled routinely. Wear suitable protective clothing and eye protection to prevent skin and eye contact. Use adequate ventilation and wear equipment and clothing as described in Section 8 and/or the product label.
Procedures for dealing with release or spill: Control the spill at its source. Contain the spill to prevent from spreading or contaminating soil or from entering sewage and drainage systems or any body of water. Clean up spills immediately, observing precautions outlined in Sections 7 and 8. Pump or scoop large amounts of liquid into a disposable container. Absorb remaining liquid or smaller spills with clay, sand or vermiculite. Scoop or sweep up material and place into a disposal container. Wash area with detergent and water. Pick up wash liquid with additional absorbent and place into compatible disposal container. On soils, small amounts will naturally decompose. For large amounts, skim off the upper contaminated layer and collect for disposal. Once all material is cleaned up and placed in a disposal container, seal container and arrange for disposal. Spillages or uncontrolled discharges into watercourses must be reported to the appropriate regulatory authority
Deactivating Chemicals: Bentonite, Fuller's Earth, Activated Charcoal.

SECTION – 7: HANDLING AND STORAGE

Handling practices: This product reacts with aluminum to produce flammable hydrogen gas. Do not mix or store in containers or systems made of aluminum or having aluminum fittings. KEEP OUT OF REACH OF CHILDREN. Prevent eating, drinking, tobacco use, and cosmetic application in areas where there is a potential for exposure to the material. Avoid breathing vapours or spray mist. If the concentrate is spilled and allowed to stand, it can dry to a highly irritating dust. Wear full protective clothing and equipment (see Section 8). After work, rinse gloves and remove protective equipment, and wash hands thoroughly with soap and water after handling, and before eating, tobacco use, drinking, applying cosmetics or using the toilet. Wash contaminated clothing before re-use and separate from household laundry. Keep containers closed when not in use. Protect product, wash or rinse water, and contaminated materials from uncontrolled release into the environment, or from access by animals, birds or unauthorized people.
Appropriate storage practices/requirements: Store in original container only in a well-ventilated, cool, dry, secure area. Protect from heat, sparks and flame. Do not expose sealed containers to temperatures above 40 °C. Keep separate from other products to prevent cross contamination. Rotate stock. Clean up spilled material immediately. **DO NOT STORE PRODUCT BELOW 0˚C – avoid freezing product during winter storage.**
National Fire Code classification: Not required.

SECTION – 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Applicable control measures, including engineering controls: Ensure work areas have ventilation, containment, and procedures sufficient to maintain airborne levels below the TLV. Warehouses, production area, parking lots and waste holding

facilities must have adequate containment to prevent environmental contamination. Provide separate shower and eating facilities.

THE FOLLOWING RECOMMENDATIONS FOR EXPOSURE CONTROLS/PERSONAL PROTECTION ARE INTENDED FOR THE MANUFACTURE, FORMULATION, PACKAGING AND USE OF THIS PRODUCT.

CONSULT THE PRODUCT LABEL FOR COMMERCIAL APPLICATIONS AND/OR ON-FARM APPLICATIONS.

Personal protective equipment for each exposure route:
General: Avoid breathing dust, vapours or aerosols. Avoid contact with eye, skin and clothing. Wash thoroughly after handling and before eating, drinking, applying cosmetics or handling tobacco.

INGESTION: Do not eat, drink, handle tobacco, or apply cosmetics in areas where there is a potential for exposure to this material. Always wash thoroughly after handling.

EYES: Where eye contact is likely, use chemical splash goggles. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

SKIN: Where contact is likely, wear chemical-resistant gloves (such as nitrile or butyl), coveralls, socks and chemical-resistant footwear. For overhead exposure, wear chemical-resistant headgear.

INHALATION: A respirator is not normally required when handling this substance. Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below exposure limits. A NIOSH-certified combination air-purifying respirator with an N, P or R 95 or HE class filter and an organic vapour cartridge may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a pressure demand atmosphere-supplying respirator if there is any potential for uncontrolled release, exposure levels are not known, or under any other circumstances where air-purifying respirators may not provide adequate protection.

SECTION – 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Dark brown liquid.
Formulation Type: Soluble concentrate.
Odour: Odourless.
pH: 4 - 6.
Vapour pressure and reference temperature: $< 10^{-8}$ mmHg @ 25 ºC (Diquat dibromide technical).
Vapour density: Not available.
Boiling point: Not available.
Melting point: Not available.
Freezing point: - 7 ºC.
Specific gravity or density: 1.20 g/mL @ 20 ºC.
Evaporation Rate: Not available.
Water/oil partition coefficient: Log K_{ow} Diquat 4.6
Odour threshold: Not available.
Viscosity: 2.3 cps @ 20 ºC.
Solubility in Water: 700 g/L @ 20 ºC.

SECTION – 10: STABILITY AND REACTIVITY

Chemical stability: Stable under normal use and storage conditions.
Conditions to avoid: Concentrate should not be stored in aluminum containers. This product reacts with aluminum to produce flammable hydrogen gas. Do not mix or store in containers or systems made of aluminum or having aluminum fittings. Spray solutions should not be mixed, stored or applied in containers other than plastic, plastic-lined steel, stainless steel or fiberglass.
Incompatibility with other materials: Strong alkalis and anionic wetting agents (e.g., alkyl and alkylaryl sulfonates). Corrosive to aluminum.
Hazardous decomposition products: Flammable hydrogen gas may be formed on contact with aluminum. See "Conditions to Avoid", Section 10. Can decompose at high temperatures forming toxic gases.
Hazardous polymerization: Will not occur.

SECTION – 11: TOXICOLOGICAL INFORMATION

Acute toxicity/Irritation Studies (Finished Product):

Ingestion:	Moderate AcuteToxicity	
	Oral (LD50 Female Rat):	886 mg/kg body weight
Dermal:	Low AcuteToxicity	
	Dermal (LD50 Rat):	> 5,050 mg/kg body weight
Inhalation:	Slightly Acutely Toxic	
	Inhalation (LC50 Rat):	= 0.62 mg/L air - 4 hours
Eye Contact:	Irritating (Rabbit)	
Skin Contact:	Slightly Irritating (Rabbit)	
Skin Sensitization:	Not a Sensitizer (Guinea Pig)	

Reproductive/Developmental Effects

Diquat dibromide:

Mutagenicity:	No evidence with *in vivo* assays.
Development Toxicity:	In rabbit studies a small percentage of fetuses had minor defects at 3 and 10 mg/kg/day.

Chronic/Subchronic Toxicity Studies

Diquat dibromide: Kidney weight decreases and cataracts seen in dogs at 12.5 mg/kg/day. No evidence for neurotoxic effects in rats dosed up to 400 ppm in the diet for 13 weeks.

Carcinogenicity

Diquat dibromide: No evidence of carcinogenicity in rat and mouse studies.

Other Toxicity Information:

None.

Toxicity of Other Components

The acute toxicity test results reported in Section 11, above, for the finished product take into account any acute hazards related to the "other components" in the formulation.

Other materials that show synergistic toxic effects together with the product: None known.

Target Organs

Active Ingredient

Diquat dibromide: Eye, kidney.

Inert Ingredients

Not applicable.

SECTION – 12: ECOLOGICAL INFORMATION

Summary of Effects

Craven is a contact herbicide that is mixed with water and applied as spray for desiccation of listed agricultural crops. The active ingredient, diquat dibromide, is practically non-toxic to insects (bees), slightly toxic to birds, moderately to highly toxic to fish and aquatic invertebrates (water flea). However, the risk to aquatic wildlife (fish and invertebrates) is expected to be low when the product is used in accordance with label directions.

Eco-Acute Toxicity

Diquat dibromide:

Green Algae 5-Day EC_{50}	11 ppm
Bees LC_{50}/EC_{50} (Contact)	47 - 100 µg/bee
Invertebrates (Water Flea) LC_{50}/EC_{50}	1.2 ppm
Fish (Trout) 96-hr LC_{50}/EC_{50}	6.1 ppm
Fish (Bluegill) 96-hr LC_{50}/EC_{50}	13.9 ppm
Birds (5-Day Dietary - Bobwhite Quail) LC_{50}/EC_{50}	> 2,677 ppm
Birds (5-Day Dietary - Mallard Duck) LC_{50}/EC_{50}	1,570 ppm

Eco-Chronic Toxicity

Diquat dibromide:

Invertebrates (Water Flea) 21-Day NOEC	50.0 ppm
Fish (Fathead) Early Life Stage NOEC	0.12 ppm

Environmental Fate

The active ingredient, diquat dibromide, has a low bioaccumulation potential, low mobility and high persistence in soil, but is non-persistent in water. Hydrolysis and evaporation are not significant. photolysis is significant on vegetation. Under field conditions, diquat dibromide is almost immediately bound to soil or vegetation. Tightly bound residues are not biologically available, so the herbicide is deactivated on soil, and bound residues are resistant to microbial degradation. The soil dissipation half-life exceeds 3 years. Dissipation half-life in water is 1-2 days as the material is bound to sediment and deactivated.

For Craven, the bulk material sinks in water (after 24 h).

SECTION – 13: DISPOSAL CONSIDERATIONS

Waste disposal information: Do not reuse empty containers unless they are specifically designed to be re-filled. Empty container retains product residue. Dispose of empty containers in accordance with local regulations. Consult provincial environment ministry for advice on waste disposal. Industrial/commercial waste may be handled at licensed facilities only. Waste shipments must be securely packaged and properly labelled. Only licensed carriers may be used, and proper documents must accompany the shipment.

SECTION – 14 : TRANSPORT INFORMATION

Shipping information such as shipping classification:

TRANSPORTATION OF DANGEROUS GOODS CLASSIFICATION - ROAD/RAIL

Proper Shipping Name	:	Corrosive Liquid, N.O.S. (diquat dibromide)
Class	:	8
UN#	:	UN1760
P.G.	:	III

SECTION – 15: REGULATORY INFORMATION

WHMIS classification for product: Exempt

A statement that the MSDS has been prepared to meet WHMIS requirements, except for use of the 16 headings.

This MSDS has been prepared in accordance with WHMIS requirements, but the data are presented under 16 headings.

Pest Control Products (PCP) Act Registration No.: 32231

SECTION – 16: OTHER INFORMATION

The information contained herein is offered only as a guide to the handling of this specific material and has been prepared in good faith by technically knowledgeable personnel. It is not intended to be all-inclusive and the manner and conditions of use and handling may involve other and additional considerations. No warranty of any kind is given or implied and Syngenta will not be liable for any damages, losses, injuries or consequential damages which may result from the use of or

reliance on any information contained herein. This Material Safety Data Sheet is valid for three years. This product is under the jurisdiction of the Pest Control Products Act and is exempt from the requirements for a WHMIS compliant MSDS. Hazardous properties of all ingredients have been considered in the preparation of this MSDS. Read the entire MSDS for the complete hazard evaluation of this product.

Prepared by: Syngenta Canada Inc.
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