MATERIAL SAFETY DATA SHEET

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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 & Biology Assessment
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SECTION – 1: PRODUCT IDENTIFICATION

Product Identifier: **SIERRA® 2.0 Herbicide** Formulation No.: N/A
Registration Number: 30430 (Pest Control Products Act)
Chemical Classes: A Sulfonylurea Herbicide and Quinoline Derivative Herbicide Antidote.

Active Ingredient (%): Flucarbazone-sodium (35.0 %) CAS No.: 181274-17-9
Chemical Name: 4,5-Dihydro-3-methoxy-4-methyl-5-oxo-N-((2-(trifluoromethoxy)phenyl)sulfonyl)-1H-1,2,4-triazole-1-carboxamidate, sodium salt.
Chemical Class: A Sulfonylurea Herbicide.

Product Use: 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†
Propylene Glycol CAS No. 57-55-6	Not Established	Not Established	10 mg/m³ TWA ****	No	Yes
Cloquintocet-Mexyl (7.5%)	Not Established	Not Established	10 mg/m³ TWA ***	No	Not Established
Flucarbazone-sodium	Not Established	Not Established	Not Established	No	Not Established

*** Syngenta Occupational Exposure Limit (OEL)
**** Recommended by AIHA (American Industrial Hygiene Association)
† 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

May cause mild to moderate eye and skin irritation. Harmful if absorbed through the skin.

Hazardous Decomposition Products

Can decompose at high temperatures forming toxic gases.

Physical Properties

Appearance: Off-white to beige viscous liquid.
Odour: Mild characteristic odour.

Unusual Fire, Explosion and Reactivity Hazards

During a fire, irritating and possibly toxic gases may be generated by thermal decomposition or combustion.

Potential Health Effects

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:

There is no specific antidote. Treat symptomatically.

MEDICAL CONDITIONS KNOWN TO BE AGGRAVATED:

Asthma or other respiratory conditions may be aggravated by chemical irritants.

SECTION – 5: FIRE FIGHTING MEASURES

Flash point and method: > 93 ºC (TCC).
Upper and lower flammable (explosive) limits in air: Not applicable.
Auto-ignition temperature: Not applicable.
Flammability: Not flammable.
Hazardous combustion products: During a fire, irritating and possibly toxic gases may be generated by thermal decomposition or combustion.
Conditions under which flammability could occur: Keep fire exposed containers cool by spraying with water.
Extinguishing media: Use water fog or mist, (avoid use of water jet), 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. 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.

SECTION – 7: HANDLING AND STORAGE

Handling practices: 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. 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. Storage temperature minimum is 0°C and not to exceed a maximum of 38 °C. Keep separate from other products to prevent cross contamination. Rotate stock. Clean up spilled material immediately.

National Fire Code classification: Not applicable.

SECTION – 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Applicable control measures, including engineering controls: This product is intended for use outdoors where engineering controls are not necessary. If necessary, 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 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, vapour 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 (such as nitrile or butyl) gloves, 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 effective engineering controls to comply with occupational exposure limits. In case of emergency spills, use a NIOSH approved respirator with any N, R, P or HE filter.

Use a self-contained breathing apparatus in cases of emergency spills, when exposure levels are unknown, or under any circumstances where air-purifying respirators may not provide adequate protection.

SECTION – 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Off-white to beige viscous liquid.
Formulation Type: Liquid.
Odour: Characteristic odour.
pH: 8.0 - 9.5 @ 25C (1% aqueous suspension)
Vapour pressure and reference temperature: Flucarbazone-sodium Technical: Not Available.

Vapour density: Not Available.
Boiling point: Not Available.
Melting point: 200 ºC (Flucarbazone Technical; decomposition)

Freezing point: Not Available.
Specific gravity or density: 1.20 g/cm^3 @ 20 ºC.
Evaporation Rate: Not available.
Water/oil partition coefficient: log Kow = -0.89, -1.84 and -1.88 @ pH 4, 7 and 9, respectively (Flucarbazone Technical).

Odour threshold: Not available.
Viscosity: Not applicable.
Solubility in Water: 3.1% (w/w) @ 20 ºC (Flucarbazone Technical).

SECTION – 10: STABILITY AND REACTIVITY

Chemical stability: Stable under normal use and storage conditions.
Conditions to avoid: None known.
Incompatibility with other materials: Avoid contact with strong alkaline or acidic materials.
Hazardous decomposition products: Can decompose at high temperatures forming toxic gases. Carbon monoxide, Carbon dioxide, Nitrogen oxides.
Hazardous polymerization: Will not occur.

SECTION – 11: TOXICOLOGICAL INFORMATION

Acute toxicity/Irritation Studies (Finished Product):

Ingestion:	Low AcuteToxicity Oral (LD50 Female Rat):	> 5,000 mg/kg body weight
Dermal:	Low Acute Toxicity Dermal (LD50 Rat):	> 2,000 mg/kg body weight
Inhalation:	Low Acute Toxicity Inhalation (LC50 Rat):	> 2.08 mg/L air - 4 hours
Eye Contact:	Mildly Irritating (Rabbit)	
Skin Contact:	Slightly Irritating (Rabbit)	
Skin Sensitization:	Not a Sensitizer (Guinea Pig)	

The following information pertains to the active ingredient, Flucarbazone-sodium Technical.

Subchronic Toxicity: In a subacute dermal study, rats were exposed to technical at 1,000 mg/kg for 6 hr/day for 22 applications. No systemic effects were observed in the treated animals. Subacute studies were conducted in rats and mice to investigate the immunotoxicological potential of technical. Rats were treated by oral gavage for 2 weeks at doses of 100, 300, 600, 1000 or 2500 mg/kg. Mice were administered dietary concentrations of 30, 100 or 1000 ppm for 2 weeks. No treatment-related adverse immunotoxic effects were determined at the end of the study in either species. The NOELs for overall toxicity were 300 mg/kg and 1000 ppm, for rats and mice, respectively.

In a 28-day subacute feeding study, technical was administered to rats at dietary concentrations of 100, 250, 2500 or 10000 ppm. The NOEL was 250 ppm based on immunotoxic effects (decreased splenic cell counts, increased macrophage activation and decreased lgA titers). In a Plaque-forming-cell assay conducted to investigate the immunotoxicological potential of technical, rats were administered dietary concentrations of 1000, 5000 or 20000 ppm for 4 weeks. A special function immunotoxicological test was performed at the end of exposure. There were no treatment-related findings observed at dietary levels up to and including 20000 ppm. The NOEL in the Plaque-forming-cell assay was 20000 ppm, the highest dose tested.

Subchronic (90 day) feeding studies were conducted on technical using mice, rats, and dogs at maximum doses of 7000, 20000, and 50000 ppm, respectively. No treatment-related findings were observed in mice at dietary levels up to and including the highest dose tested. In rats, effects observed included clinical signs of toxicity, changes in clinical chemistries, immunologic changes, reduced spleen weights and histopathological findings in the forestomach. The immunologic changes were completely or largely reversible with only minimal changes observed at the end of a 5-week recovery period. When dogs were administered technical, effects observed included changes in clinical chemistries, hematological changes, red discoloration of the gastric mucosa at necropsy, increased liver and adrenal weights, and histopathological findings (stomach, liver, kidney, adrenals). The overall NOELs established in these studies were 7000 ppm for mice, 250 ppm for rats, and 1000 ppm for dogs.

Chronic Toxicity: Dogs were administered Flucarbazone-sodium at dietary concentrations of 200, 1000 or 5000 ppm for 1 year. Effects observed in the study included decreased body weights, increased levels of ALAT, ASAT, GLDH, and N-Demethylase, transient decreased levels of thyroxine (T4), and increased liver weights. The decrease in T4 levels was most likely related to an increased hepatic clearance and not a primary effect on the thyroid. This was based on the absence of effects on the other thyroid biomarkers, the slightly increased N-Demethylase levels, and the increased liver weights. The overall NOEL in the dog was 200 ppm. In a 2-year study, rats were administered Flucarbazone-sodium via the diet. The mean daily intake per kg body weight was adjusted on a weekly basis to achieve a daily exposure of 2.5, 7.5, 125 or 1000 mg/kg. Effects observed at the end of the study included decreased body weights, increased food consumption, and an increased incidence of some gross- and histopathological-findings observed in the stomach. The NOEL in the rat was 125 mg/kg.

Carcinogenicity: Flucarbazone-sodium was investigated for carcinogenicity in chronic feeding studies using rats and mice at maximum levels of 1000 mg/kg and 7000 ppm, respectively. There was no evidence of a carcinogenic potential observed in either species.

Mutagenicity: The results of in vitro and in vivo mutagenicity studies on Flucarbazone-sodium are all negative.

Developmental Toxicity: In a developmental toxicity study in rats, Flucarbazone-sodium was administered by oral gavage during gestation at doses of 100, 300 or 1000 mg/kg. Flucarbazone-sodium did not induce any maternal or developmental toxicity at doses up to and including 1000 mg/kg, the limit dose. The NOEL for maternal and developmental toxicity in the rat was 1000 mg/kg. In a developmental toxicity study in rabbits, technical was administered by oral gavage during gestation at doses of 100, 300, 500, or 1000 mg/kg. Developmental effects such as abortions, decreased fetal weights, and delayed skeletal ossification occurred in correlation with systemic maternal toxicity. The NOEL for both maternal and developmental toxicity in the rabbit was 100 mg/kg.

Reproduction: In a reproduction study, Flucarbazone-sodium was administered to rats for 2 generations at dietary concentrations of 50, 4000 or 20000/12000 ppm. The high dose was reduced to 12000 ppm after five weeks due to a sharp increase in food intake that resulted in unphysiologically high feces excretion and water consumption

accompanied by diarrhea. Other parental toxicity included decreased body weights, decreased organ weights (liver, uterus, spleen), and an increased incidence of caecal dilatations. Effects observed in the offspring included decreased pup weights, decreased liver weights and an increased incidence of a marbled liver surface and air-filled stomachs in pups necorpsied at culling. The overall parental NOEL was 50 ppm. The NOEL for reproductive toxicity was 4000 ppm.

Neurotoxicity: In an acute neurotoxicity screening study using rats, Flucarbazone-sodium was administered as a single oral dose at levels of 125, 500 or 2000 mg/kg. Transient clinical signs of toxicity and neurobehavorial effects were observed at the high dose without correlating micropathological findings. The NOEL for microscopic lesions was 2000 mg/kg, the highest dose tested. The NOEL for overall toxicity was 500 mg/kg. In a 13-week neurotoxicity screening study, Flucarbazone-sodium was administered to rats at dietary concentrations of 250, 2000 or 20000 ppm. Body weight and food consumption was reduced at the high-dose level. Functional observational battery (FOB) and automated measures of motor and locomotor activity were not affected by treatment. There were no treatment-related microscopic lesions in neural tissues or skeletal muscle in any of the treated animals. There was no evidence of neurotoxicity at any dietary level. The NOEL for microscopic lesions was 20000 ppm, the highest dose tested. The NOEL for overall toxicity was 2000 ppm.

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.

Cloquintocet-mexyl:

May cause mild eye and skin irritation. Harmful if inhaled. Allergic skin reactions are possible.

Propylene Glycol

Reported to cause central nervous system depression (anesthesia, dizziness, confusion), headache and nausea. Also, eye irritation may occur with lacrimation but no residual discomfort or injury. Prolonged contact to skin may cause mild to moderate irritation and possible allergic reactions. Chronic dietary exposure caused kidney and liver injury in experimental animals.

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

Target Organs

Active Ingredient	
Flucarbazone Technical:	Liver, stomach.
Cloquintocet-Mexyl:	Thyroid, kidney, bone marrow, thymus.
Inert Ingredients	
Propylene Glycol	CNS, skin, eye, kidney, liver.

SECTION – 12: ECOLOGICAL INFORMATION

Summary of Effects

The active ingredient, flucarbazone, is practically non-toxic to aquatic invertebrates, fish, birds and mammals, but is phytotoxic to non-target terrestrial and aquatic plants.

Eco-Acute Toxicity

Flucarbazone Technical:

Algae (Green) 96-hour IC_{50}	6.4 mg/L
Invertebrates (*Daphnia magna*) 48-hour EC_{50}	38.8 mg/L
Fish (Rainbow Trout) 96-hour LC_{50}	> 96.7 mg/L
Birds (Bobwhite Quail) Oral LD_{50}	> 2,000 mg/kg bw

Environmental Fate

Flucarbazone-sodium is slightly persistent in soils under field conditions. The parent compound and transformation products have a low potential to leach and contaminate groundwater under field conditions.

SECTION – 13: DISPOSAL CONSIDERATIONS

Waste disposal information: Do not reuse empty containers unless they are specifically designed to be refillable. Empty container retains product residue. Triple rinse, empty container, return rinse water to dilution mixture, and dispose of dilution mixture as a hazardous waste if it cannot be disposed of by use according to label instructions. 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
Not Regulated.

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.

Other regulations; restrictions and prohibitions

Pest Control Products (PCP) Act Registration No.: 30430

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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