DuPont™ Telar® XP

herbicide

Technical Bulletin

IDENTITY OF ACTIVE INGREDIENT

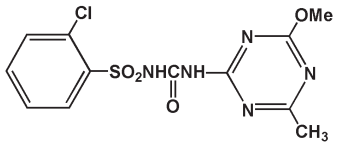
Chemical Name
2-Chloro-N-[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)aminocarbonyl] benezenesulfonamide

Common Name
Chlorsulfuron

% Active Ingredient:
75

Molecular Weight
357.77

Structural Formula



Chemical Family
Sulfonylurea

CAS Registry Number
64902-72-3

Empirical Formula
$C_{12}H_{12}ClN_5O_4S$

U.S. EPA Registration No(s).
352 - 516 (Technical)
352 - 654 (DuPont™ Telar® XP)

PHYSICAL AND CHEMICAL PROPERTIES OF THE ACTIVE INGREDIENT

State (solid or liquid)
Solid

Color
White

Odor
Odorless

Boiling Point
NA

Melting Point
174 - 178°C

Density
0.64 g/ml

Solubility in Water
876 ppm at pH 5; 12,560 ppm at pH 7

Vapor Pressure
2.93×10^{-11} mm hg at 25°C

Octanol/Water Partition Coefficient (K_{ow})
2.13 at pH 5
0.10 at pH 7
0.04 at pH 9

Stability
Stable at room temperature

Oxidizing/Reducing Activity
Not available

Flammability
Product is dry and noncombustible

Explodability
Not an explosion hazard

Storage Stability
Stable at normal temperatures and storage conditions.

Viscosity
NA

Miscibility
NA

Corrosion Characteristics
Noncorrosive

BIOLOGICAL ACTIVITY AND USE

General Information

DuPont™ Telar® XP (chlorsulfuron) herbicide is formulated as a water dispersible granule to be mixed in water and applied as a spray at non-crop sites for the control of susceptible annual and perennial broadleaf weeds. Telar® XP is recommended for general weed control on private, public and military lands as follows: uncultivated non-agricultural areas (such as airports, highway, railroad and utility rights-of-way); uncultivated agricultural areas (non-crop producing, which includes: farmyards, fuel storage areas, fence rows, barrier strips); industrial sites (outdoor, such as lumberyards, pipeline and tank farms).

Apply by ground or aerial application equipment. There are no grazing or hay harvest restrictions for any livestock, including lactating animals, with application rates up to 1⅓ ounces per acre. No exclosure is required for any animals.

This product may be applied on pasture, range and non-crop sites that contain areas of temporary surface water caused by collection of water in equipment ruts or in other depressions created by management activities. It is also permissible to treat intermittently flooded low-lying areas, seasonally dry flood plains and transitional areas between upland and lowland sites when no water is present. It is also permissible to treat marshes, swamps and bogs after water has receded, as in seasonally dry flood deltas. Do not make applications to natural or man-made bodies of water such as lakes, reservoirs, ponds, streams and canals.

Mode of Action

Chlorsulfuron inhibits acetolactate synthase (ALS), a key enzyme in plants needed in the biosynthesis of the branched amino acids isoleucine, leucine and valine. Animals do not possess this enzyme to synthesize proteins.

Use Rate and Biological Activity

Telar® XP is to be applied at use rates of 0.25 to 3.0 ounces of product per acre. When applied as a spray, Telar® XP is absorbed by both roots and foliage of plants, rapidly inhibiting the growth of susceptible weeds. Warm, moist conditions following application accelerate the herbicidal activity of Telar® XP; cold, dry conditions delay the herbicidal activity. Weeds hardened off by drought or other plant stresses are less susceptible to Telar® XP.

Weeds Controlled

Telar® XP controls many broadleaf weeds, including Canada thistle, Scotch thistle, puncturevine, wild carrot, common mullein, equisetum, pigweeds, goldenrod, common sunflower, whitetop, curly dock and poison hemlock. The degree and duration of control may depend on the weed spectrum and infestation intensity, weed size at application, soil type, organic matter content and environment conditions at and following application.

Uptake, Absorption and Translocation Characteristics

Chlorsulfuron is rapidly taken up by both the roots and foliage of plants. Chlorsulfuron translocates readily in the xylem following root absorption, but less so in the phloem after foliar applications. Chlorsulfuron accumulates in the meristematic areas of plants.

Soil Activity and Degradation

Chlorsulfuron has moderate affinity for soil organic matter (OM), but adsorption to clay is low. Some photodegradation occurs under field conditions and microbial breakdown is relatively more important in alkaline soils. Chemical hydrolysis plays an important role in chlorsulfuron breakdown, but rates are slow at pH 7.5 to 8 and increase as pH decreases. The sulfonylurea bridge is cleaved through hydrolysis to form inactive products. The average laboratory soil half-life is 46 days (corrected to 25° C) and is dependent upon soil pH. The half-life is shorter in lower pH soils (13 days in soils of pH < 6.0; 32 days in soils of pH 6.0 to < 7.5) and longer in higher pH soils (75 days in soils of pH > 7.5). Field studies at three sites with soils of pH > 7.5 showed an average half-life of 53 days, demonstrating that field soil dissipation can be faster than that exhibited under laboratory conditions. Based upon laboratory adsorption-desorption studies chlorsulfuron is considered to be moderately mobile in soils of high pH, with less potential for leaching at pH < 6. However, field studies conducted in high pH soils over a year and a half have shown that most of the chlorsulfuron applied to soil remains in the plow layer (upper 30 cm).

Plant Selectivity, Sensitivity and Residues

Telar® XP herbicide is registered for use in non-crop situations only and care should be exercised when it is used in the vicinity of crop plants. Exposure to Telar® XP may injure or kill most crops.

Metabolism in Plants

Plant species vary widely in their ability to metabolize sulfonylurea products. The ability to metabolize or detoxify these products is the basis for the selectivity shown by tolerant versus susceptible plant species. Tolerant plants convert or break down chlorsulfuron to herbicidally inactive products much faster than do sensitive plants.

Toxicity and Metabolism in Animals

Chlorsulfuron has low toxicity to mammals, birds and insects. Chlorsulfuron does not bio-accumulate in warm or cold-blooded animals. Chlorsulfuron is rapidly absorbed and eliminated.

FATE AND BEHAVIOR IN THE ENVIRONMENT

(See section on "Soil Activity and Degradation")

Use rate	Dissociation constant
0.25 to 3.0 ounces DuPont™ Telar® XP per acre	3.6 at 25°C
Soil sorption coefficient	
Koc: Average is 34 mL/g and ranged from 13 to 58 in 4 soils. Kd: Average is 0.39 mL/g and ranged from 0.08 to 0.89.	

RESIDUES IN FOOD — Not Applicable. Telar® XP is not labeled for use on food crops.

TOXICITY OF TECHNICAL ACTIVE INGREDIENT

Acute Toxicity — Chlorsulfuron	
Acute oral toxicity — rodent	5544 mg/kg
Acute dermal toxicity — rabbit	3400 mg/kg
Acute inhalation toxicity — rodent	≥ 5.5 mg/L/4 hrs
Skin irritation — rabbit	None
Eye irritation — rabbit	Moderate
Skin sensitization — guinea pig	Negative

Subchronic Toxicity — Chlorsulfuron	
Subchronic toxicity — rodent	NOEL: 2500 ppm
Subchronic toxicity — dog	NOEL: 500 ppm
Repeated dose dermal toxicity — rat, rabbit or guinea pig	NA

Chronic Toxicity & Carcinogenicity	
Rodent — chlorsulfuron	Not oncogenic

Reproductive Toxicity — Chlorsulfuron	
Teratology — rodent	NOEL maternal: 165 mg/kg/d NOEL fetal: 500 mg/kg/d Not teratogenic
Teratology — rabbit	NOEL maternal: 75 mg/kg/d NOEL fetal: 200 mg/kg/d Not teratogenic
Multigeneration reproductive toxicity — rodent	NOEL for reproductive toxicity: 7500 ppm NOEL for systemic toxicity: 2500 ppm
Multigeneration reproductive toxicity — non-rodent	NOAEL systemic parental toxicity: 151 mg/kg bw/d NOAEL reproductive/fertility: 498 mg/kg bw/d NOAEL offspring: 498 mg/kg bw/d

Genotoxicity — Chlorsulfuron	
Ames bacterial mutagenicity assay	Negative
Other: structural chromosome aberration	Negative
Other: DNA damage/repair	Rat hepatocytes/UDS, negative

Acute Toxicity — Telar® XP	
Acute oral toxicity — rodent	> 2000 mg/kg
Acute dermal toxicity — rodent	> 5000 mg/kg
Skin irritation — rabbit	None
Eye irritation — rabbit	Slight
Skin sensitization — guinea pig	Negative

HUMAN EXPOSURE, RISK AND SAFETY INFORMATION

Chlorsulfuron	
PEL (OSHA)	None established
TLV (ACGIH)	None established
AEL* (DuPont): TWA	10 mg/m^3, 8 & 12 hr TWA
PPE (Personal Protective Equipment)	Applicators and other handlers must wear: — Long-sleeved shirt and long pants. — Chemical-resistant gloves made of any waterproof material such as polyethylene or polyvinyl chloride. — Shoes plus socks.
Protection Information	DuPont™ Telar® XP: Harmful if swallowed. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, or using tobacco. In case of contact with eyes, hold eye open and rinse slowly and gently with water for 15 to 20 minutes. Call a poison control center or doctor for further treatment advice. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product. Follow manufacturer's instructions for cleaning/ maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

* AEL is DuPont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

WILDLIFE AND OTHER NON-TARGET SPECIES

Chlorsulfuron		
Avian species — LD_{50}	Mallard duck	> 5000 mg/kg/d
Aquatic species — LC_{50}	Sheepshead minnow Rainbow trout	> 980 mg/L > 250 mg/L
Terrestrial invertebrates (bees) — Oral and contact LD_{50}	Honeybee	> 25 µg /bee

Chlorsulfuron

Primary Industry Source: DuPont.

1. Brown, H.M. 1990. Mode of action, crop selectivity, and soil relations of the sulfonylurea herbicides. *Pesticide Science.* 29:263-281.
2. Joshi, M.M., Brown, H.M., Romesser, J.A. 1985. Degradation of chlorsulfuron by soil microorganisms. *Weed Science.* 33 (6):888-893.
3. LaRossa and Schloss. 1984. *J. Biol. Chem*. 259:8753.
4. Wauchope, R. D. et al. 1992. *Rev. Environ. Contam. Toxicol.* 123:1.
5. Schmuckler, M.E. et al. 2000. *Pest Management. Science.* 56:521.
6. Strek, H.J. 1998. Fate of chlorsulfuron in the environment. 1. Laboratory evaluations. *Pesticide Science.* 53 (1):29-51.
7. Strek, H.J. 1998. Fate of chlorsulfuron in the environment. 2. Field evaluations. *Pesticide Science.* 53 (1):52-70.

Reorder No.: K-14605

DUPONT®

The miracles of science™