DuPont™ Escort® XP

herbicide

Technical Bulletin

IDENTITY OF ACTIVE INGREDIENT

Chemical Name (IUPAC)
2-(4-methoxy-6-methyl-1,3,5-triazin-2-ylcarbamoylsulfamoyl)benzoic acid

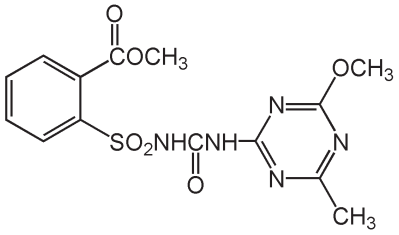
Common Name (ANSI, BSI, ISO, WSSA)
Metsulfuron Methyl

Chemical Family
Sulfonylurea

Molecular Weight
381.36

Molecular Formula
$C_{14}H_{15}N_5O_6S$

Chemical Structure



CAS Registry Number
74223-64-6

U.S. EPA Registration No.
352-439

PHYSICAL AND CHEMICAL PROPERTIES OF THE TECHNICAL INGREDIENT

State (solid or liquid)
Solid

Color
White to pale yellow

Odor
Faint, sweet ester-like

Boiling point
NA

Melting point
158°C

Density
1.74 g/mL at 25°C

Solubility in Water at 25°C
548 mg/L at pH 5; 2790 mg/L at pH 7; 213,000 mg/L at pH 9

Vapor Pressure
3.3×10^{-10} Pa; Henry's Law constant is 2.3×10^{-15} atm-m3/mole

Octanol/Water Partition Coefficient (K_{ow})
1 at pH 5
0.018 at pH 7

Stability
Decomposes at 172°C

Oxidizing/Reducing Activity
Technical and formulated products are considered non-oxidizing and non-reducing.

Flammability
Technical and formulated products are dry and non-flammable.

Explodability
Non-explosive

Storage Stability
Formulated products are stable if stored in an air-tight container to keep free of moisture and high humidity.

Viscosity
NA

Miscibility
NA

Corrosion Characteristics
Non-corrosive

Soil Sorption Coefficient (Koc)
4-207 average 41

Dissociation Constant
pKa — 3.3 at 25°C

Half-life in Water
pH 5=21 days
pH 7=stable
pH 9=stable

Soil Leachability
Limited

BIOLOGICAL ACTIVITY AND USE

General Information
DuPont™ Escort® XP herbicide is a dispersible granule that is mixed in water and applied as a spray by ground or aerial application. Escort® XP is recommended for the control of annual and perennial weeds and unwanted woody plants on private, public and military lands, on rights-of-way, industrial sites, non-crop areas, ditch banks of dry drainage ditches, certain types of unimproved turf grass, and conifer and hardwood plantations, including grazed areas on these sites. Do not use on irrigation ditches. Escort® XP controls weeds and woody plants primarily by postemergent activity. Although Escort® XP has preemergence activity, best results are generally obtained when Escort® XP is applied to foliage after emergence or dormancy break. Generally, for the control of annual weeds, Escort® XP provides the best results when applied to young, actively growing weeds. For the control of perennial weeds, applications made at the bud/bloom stage or while the target weeds are in the fall rosette stage may provide the best results.

Escort® XP may be applied on conifer and hardwood plantations and non-crop sites that contain areas of temporary surface water caused by the collection of water between planting beds, in equipment ruts or in other depressions created by management activities. It is permissible to treat intermittently flooded low-lying sites, 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 well as seasonally dry flood deltas.

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 1⅔ ounces per acre. No exclosure is required for any animals. Do not make applications to natural or man-made bodies of water such as lakes, reservoirs, ponds, streams and canals.

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

Use Rate and Biological Activity
Escort® XP is to be applied at use rates of 0.3 to 4.0 ounces of product per acre. When applied as a spray, Escort® 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 Escort® XP; cold, dry conditions delay the herbicidal activity. Weeds hardened off by drought or other plant stresses are less susceptible to Escort® XP.

Weeds Controlled
Escort® XP controls many broadleaf and brush weeds, including annual sowthistle, chicory, dandelion, goldenrod, sericea lespedeza, common mullein, perennial pepperweed, halogeton, bull thistle, blackberry, honeysuckle, ash, black locust, Eastern red cedar, multiflora rose, red maple, tree of heaven (ailanthus), snowberry, willow and yellow poplar. 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 environmental conditions at and following application.

Uptake, Absorption and Translocation Characteristics
Escort® XP is absorbed primarily through the foliage of plants, and by the roots to a lesser degree. Escort® XP translocates extensively in the xylem following root absorption. Plant cell division is generally inhibited in sensitive plants within a few hours following uptake. 2 to 4 weeks after application, leaf growth slows, followed by discoloration and tissue death. The final effects on annual weeds are evident about 4 to 6 weeks

after application. The ultimate effect on perennial weeds and woody plants occurs in the growing season following application. Warm, moist conditions following treatment promote the activity of Escort® XP, while cold, dry conditions may reduce or delay activity. Weeds and brush hardened off by cold weather or drought stress may not be controlled.

Soil Activity and Degradation

Microbial degradation is slow. Non-microbial hydrolysis is slow at high pH, but relatively rapid at lower pH. Hydrolysis cleaves the sulfonylurea bridge. Overall half-life varies from 1 week to 1 month, depending primarily on soil pH. Considered to be moderate residual with a typical half-life of 30 days, but ranging from 1 to 6 weeks. Degradation rate increases with higher temperatures and high soil moisture levels.

Plant Selectivity, Sensitivity and Residues

Escort® 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 Escort® 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 metsulfuron methyl to herbicidally inactive products much faster than do sensitive plants.

Toxicity and Metabolism in Animals

Metsulfuron methyl has low toxicity to mammals, birds and insects. Metsulfuron methyl does not bioaccumulate in warm- or cold-blooded animals. Metsulfuron methyl is rapidly absorbed and eliminated.

FATE AND BEHAVIOR IN THE ENVIRONMENT

Metsulfuron methyl degrades at a moderate rate in soil, having half-lives in soil ranging from 9 to 43 days under laboratory conditions with an average half-life of 23 days (13 soils). Half-lives in soil under field conditions ranged from 7 to 211 days with an average half-life of 51 days (17 soils). The longer field half-lives can be attributed to fall applications for some of the field studies.

Metsulfuron methyl degrades slowly in aquatic systems, having half-lives which ranged from 53 to 279 days in two water sediment systems. Metsulfuron methyl is stable to photolysis.

Laboratory studies show that metsulfuron methyl is weakly to moderately sorbed to soil (average Koc of 41 mL/g). However, field lysimeter studies show that under field conditions, metsulfuron methyl has limited mobility.

RESIDUES IN FOOD — Not Applicable.

Escort® XP is not labeled for use on food crops.

TOXICITY OF TECHNICAL ACTIVE INGREDIENT

Acute Toxicity	
Acute oral toxicity — LD_{50} rat	> 5000 mg/kg
Acute dermal toxicity — LD_{50} rabbit	> 2000mg/kg
Acute inhalation toxicity — LC_{50} rat	> 5.3 mg/L/4 hour inhalation
Skin irritation — rabbit	Not irritating
Eye irritation — rabbit	Moderately irritating
Skin sensitization — guinea pig	Not sensitizing

Subchronic Toxicity	
90-day dietary — mouse	NOAEL 814 mg/kg bw/day; highest dose tested
90-day dietary — rat	NOEL 68 mg/kg bw/day; based on body weight changes at higher doses
90-day dietary — dog	NOAEL 129 mg/kg bw/day; highest dose tested
21-day dermal — rabbit	NOAEL 125 mg/kg bw/day for local effects, based on dermal irritation at higher doses; NOAEL 2000 mg/kg bw/day for systemic effects, the highest dose tested

Chronic Toxicity	
18 month dietary — mouse	NOAEL 666 mg/kg bw/day, highest dose tested; Not oncogenic
24 month dietary — rat	NOEL 22/30 mg/kg bw/day males/females, based on mild body weight effects at higher doses; Not carcinogenic up to the highest dose tested 226/300 mg/kg bw/day in males/females
12 month dietary — dog	NOAEL 125 mg/kg bw/day, highest dose tested

Teratogenicity	
Rat	Maternal NOAEL 250 mg/kg/day, severe body weight changes and salivation at 1000 mg/kg/day; Developmental NOAEL 1000 mg/kg bw, highest dose tested; Not teratogenic or embryotoxic
Rabbit	Maternal NOAEL 25 mg/kg/day, mortality and decreased body weight gain at > 100 mg/kg/day; Developmental NOAEL > 700 mg/kg bw/day, highest dose tested; Not teratogenic or embryotoxic

Reproductive Toxicity	
Rat	Reproductive NOAEL 5000 ppm (342-386 mg/kg in males, 406-474 in females); highest dose tested
Paternal/ Systemic	NOAEL 500 ppm (34 and 35 mg/kg bw F_0 and F_1 males; 39 and 43 mg/kg bw F_0 and F_{1B} females); based on body weight effects at 5000 ppm
Offspring	NOAEL 5000 ppm (342 to 474 mg/kg bw); highest dose tested

Genotoxicity	
Gene mutation bacterial: *Ames test*	Negative
Gene mutation mammalian cell culture: *CHO HPRT*	Negative
Structural chromosome aberration: *In vitro* cytogenetics — CHO *In vivo* rat chromosome aberration *In vivo* mouse micronucleus	 Positive Negative Negative
DNA damage/repair: Primary rat hepatocytes/UDS	Negative
Metsulfuron methyl does not cause genetic damage in vivo. The positive effect observed in a single in vitro cytogenetic assay was not reproduced in vivo.	

NEUROTOXICITY — No indication of neurotoxicity seen in the available studies.

HUMAN EXPOSURE, RISK AND SAFETY INFORMATION

Toxicity Criteria

U.S. EPA Chronic RfD — 0.25 mg/kg bw/day

U.S. EPA Cancer Classification

"Not likely to be a human carcinogen."

Consumer — Aggregate Exposure and Risk

EPA estimates aggregate exposures well within acceptable limits, < 1.0% of cPAD.

Occupational Exposure and Risk (mixer, loader and applicator)

Exposures are well within the acceptable limits when label directions are followed.

WILDLIFE AND OTHER NON-TARGET SPECIES

Bobwhite quail — 8 day dietary LC_{50}	>5620 ppm
Mallard duck — Oral LD_{50} 8 day dietary LC_{50}	>2510 mg/kg >5620 ppm
Bluegill sunfish — 96 hours LC_{50}	>150 mg/L
Rainbow trout — 96 hours LC_{50}	>150 mg/L
Daphnia — 48 hour LC_{50}	>120 mg/L
Earthworm — LC_{50} in soil	>1000 mg/kg
Honey bee — Topical LD_{50}	>100 µg/bee

METSULFURON METHYL

Primary Industry Source: DuPont

1. Doig, R.I. et al. 1983. *Proc. 10th Intern. Congr. Plant Prot.* 1:324.
2. Hershberger and Brennan. 1988. *Anal. Meth. Pestic. Plant Growth Regul.* 16:83.
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 Mangmt. Sci.* 56 :521-532.

This reference guide is not intended as a substitute for the product label for the product(s) referenced herein. Product labels for the above product(s) contain important precautions, directions for use and product warranty and liability limitations that must be read before using the product. Applicators must be in possession of the product label(s) at the time of application. Always read and follow all label directions and precautions for use when using any pesticide alone or in tank mix combinations.

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