

PESTICIDE TYPE	Herbicide
CHEMICAL CLASS	Benzoylpyrazole
COMMON TRADE NAMES	ShieldEx 400SC
MAJOR DEGRADATE	MT-2153
APPLICATION RATE (lb a.i./A/year)	Max Annual: 0.070
REGISTRATION STATUS	EPA: Registered unconditionally in July 2017 Minnesota: December 2017
TOXICITY PROFILE FOR APPLICATORS	Signal word: Caution III (dermal) IV (skin irritation),
BASIC MANUFACTURER	ISK Biosciences Corporation
MDA LABORATORY CAPABILITIES	In discussion

HUMAN HEALTH	
NON-CANCER	Acute PAD= 0.05 mg/kg/day Chronic PAD= 0.0093 mg/kg/day
CANCER	Suggestive evidence of carcinogenic potential

Acute and chronic PADs are doses that include all relevant uncertainty and safety factors

ENVIRONMENTAL AQUATIC TOXICITY	
FISH	Acute: >9500 ppb Chronic: 33.2 ppb
INVERTEBRATE	Acute: >9750 ppb Chronic: 8960ppb
AQUATIC PLANTS	Vascular (IC ₅₀): 6.67 ppb Non-vascular (IC ₅₀): 191 ppb

POLLINATOR TOXICITY	
HONEY BEE	Acute Contact (LD ₅₀): >43.2 µg/bee Acute Oral (LD ₅₀): >40 µg/bee

Level of Concern (LOC) has been applied to all values.



Introduction

Tolpyralate belongs to the 4-hydroxyphenyl-pyruvate dioxygenase (HPPD) inhibitor class of herbicides (Herbicide Resistance Action Committee (HRAC) Group F2 and Weed Science Society of America (WSSA) Group 27). This new active ingredient blocks carotenoid biosynthesis in plants by inhibiting the function of HPPD enzyme and eventually causes bleaching of new plant growth. Tolpyralate selectivity kills weeds without injuring corn because corn can rapidly metabolize tolpyralate into inactive compounds. The USEPA has registered tolpyralate for weed control in field corn, seed corn, sweet corn, and popcorn. Tolpyralate is not a restricted use herbicide and can be used as part of an Integrated Weed Control Program with other weed control measures including herbicides of other modes of action. Tolpyralate may be applied postemergence on corn up to 20" tall or up to and including V6 growth stage, whichever is more restrictive. Tolpyralate is registered for postemergence application of 0.026 or 0.035 lb a.i./A with maximum of 0.07 lb a.i./A/year; however, split application with minimum of 14 day retreatment interval is allowed. The Minnesota Department of Agriculture (MDA) extensive review of the EPA tolpyralate product labels and risk assessments for issues relevant to Minnesota is summarized below.

Projected Use in Minnesota

- This active ingredient provides control of pigweed species, common ragweed, hairy nightshade, barnyardgrass, and foxtail species. According to the University of Minnesota extension, tolpyralate was not evaluated on corn in Minnesota specific conditions. Based on Michigan State University research trials and published literature, tolpyralate looks promising in controlling weeds like foxtail species, pigweed species, common lambsquarters, common ragweed, and velvetleaf in corn.
- Tolpyralate 400SC (EPA Reg. No. 71512-29) - The product carries 35.7% of tolpyralate and is approved on field corn, seed corn, sweet corn, and popcorn for postemergence broadleaf weeds and grasses control.

Label Environmental Hazards

Water Quality:

- Do not apply this product directly to water or where conditions could favor runoff. Tolpyralate product label carries following groundwater and surface water advisories:
- Groundwater: This product has properties and characteristics associated with chemicals detected in groundwater and may leach into groundwater particularly where soils are permeable and water table is shallow.
- Surface water: This product has high potential for reaching surface water via runoff for several months or more after application specially in poorly draining soils and soils with shallow groundwater. The product label carries advisory to maintain a level buffer strip between the application field and the surface water to reduce runoff.

Other:

- Applicators must wear long-sleeved shirt and long pants, shoes plus socks, and waterproof gloves.
- Do not apply tolpyralate by air or through any type of irrigation system. Do not apply tolpyralate more than 2 feet above the ground or crop canopy.
- Use medium to coarse spray droplet size. Do not apply when wind speeds exceed 10 mph or during temperature inversions.

Toxicology and Exposure

EPA's screening models generate high-end, conservative exposure estimates for active ingredients and toxicologically significant degradates. Model inputs include annual usage at maximum use rates, maximum treated acres, maximum food residues, peak runoff and drift scenarios, etc. Some proposed products, application rates and use scenarios are not relevant to Minnesota. EPA's estimates, therefore, may not reflect future use and impacts in Minnesota.

Human Health

- **Carcinogenic Effects**- Tolpyralate is classified as "suggestive evidence of carcinogenic potential in humans".
- **Drinking Water Guidance**- Model estimates indicate that based on the proposed use pattern on corn, humans may be exposed to tolpyralate or its degradate, MT-2153, from migration of residues to surface and/or groundwater sources of drinking water. Tolpyralate is not likely to reach groundwater because of the rapid transformation to MT-2153; however, MT-2153 may reach groundwater. The modelled upper bound total estimated drinking water concentrations from two applications of tolpyralate in corn were 11.53 ppb. An appropriate endpoint was not identified for this exposure scenario (two applications in corn). At this time, there are no residential uses of tolpyralate.
- **Occupational Exposure**- During mixing/loading/applying, there is a potential for occupational short- and intermediate-term dermal, inhalation, and combined (dermal and inhalation) exposures.

Environment- Non-target Species

- **Stressor of concern**- Both tolpyralate and its degradates MT-2153 were identified as residues of potential concern for ecological effects because tolpyralate rapidly converts to MT-2153 following application (aerobic soil and aquatic half-life values are < 2 days).
- **Aquatic & Terrestrial Life Exposure**- Tolpyralate and MT-2153 are considered to be practically nontoxic to birds, mammals, terrestrial invertebrates, reptiles, and terrestrial based amphibians on an acute exposure basis. No risk concerns were identified to freshwater fish from tolpyralate and MT-2153. However, chronic exposure risks were identified for birds, mammals and vertebrate animals for tolpyralate. Based on the available data, the EPA concluded that proposed use is not predicted to result in exposure levels high enough to cause reproductive or developmental effects in animals, but possible adverse weight effects may occur in adult birds. Because tolpyralate is highly toxic to sensitive plants, its proposed use may pose risk to non-listed dicot and monocot terrestrial plants, and aquatic vascular plants. The label language under environmental hazards and mandatory spray drift management sections is intended to mitigate these identified risks.

Environmental Fate

Tolpyralate is a relatively nonvolatile and mobile in soil. This herbicide may move to groundwater via leaching and may move to surface water bodies via spray drift and runoff.

Soil

- **Half-life** - Aerobic: 0.1 to 1.2 days.
Anaerobic: 0.176 days.
- **Mobility** - K_{oc} is 11 to 85 L/kg_{oc}.
- **Photolysis**: Stable.
- **Persistence**- DT₅₀ value 1 to 6 days.

Aquatic

- **Half-Life**- Aerobic: 1.4 to 1.8 days.
Anaerobic: 1.37 to 2.61 days.
- **Half-life via hydrolysis**: 0.36 to 345 days.
- **Photolysis in water**: 2.86 days.

Air

- **Volatilization**- nonvolatile, Vapor pressure = 4.4×10^{-6} Torr; Henry's Law Constant 1.1×10^{-7} atm m³ mole⁻¹. Tolpyralate is not likely to volatilize from soil or water.

Degradates

Tolpyralate rapidly breaks down to its principal degradate, MT-2153, which is more mobile and stable than parent compound and is expected to be herbicidally active. MT-2153 may leach to groundwater because of its high mobility. It may end up in nearby surface water bodies from runoff from soil surface or wash off from plant surface. However, MT-2153 is not expected to accumulate year after year. Like the parent compound, MT-2153, has low acute toxicity to animals, freshwater fish, freshwater invertebrates, and mammals on acute exposure bases. However, no data were available for chronic toxicity of MT-2153. In the absence of available data, the EPA assumed that chronic toxicity MT-2153 is equal to tolpyralate. MMTA, EVC-005, and EVC-006 are the other degradates.