**Physico-Chemical Properties**

**Class:** Pyrazole  
**IUPAC name:** (R,S)-1-(1-ethyl-4-(4-methyl-3-(2-methoxyethoxy)-o-toluyl)-1H-pyrazol-5-yl)oxy)ethyl methyl carbonate  
**Molecular weight:** 484.52  
**Molecular formula:** C_{21}H_{28}N_{2}O_{9}S  
**Vapour pressure:** 5.9×10^{-4} Pa (25 °C)  
**Water solubility:** 26.5 mg/L (20 °C)  
**Form:** Off-white solid  
**Development code:** SL-573

**Toxicology & Ecotoxicology**

- **Rat LD_{50} (oral):** > 2,000 mg/kg (f)  
- **Rat LD_{50} (dermal):** > 2,000 mg/kg (m/f)  
- **Rat LC_{50} (inhalation):** > 2.01 mg/L (m/f)  
- **Skin irritation:** non irritant (rabbit)  
- **Eye irritation:** GHS Not classified (rabbit)  
- **Skin sensitization:** not a sensitizer (guinea pig)  
- **Avian LD_{50} (acute oral):** > 2,000 mg/kg (quail, m/f)  
- **Avian LD_{50} (subacute oral):** > 5,000 ppm in feed (quail)  
- **Fish LC_{50}:** > 22 mg/L (carp, 96 h)  
- **Bees LD_{50} (acute oral):** > 107.7 μg a.i./bee (48 h)  
- **Bees LD_{50} (acute contact):** > 100 μg a.i./bee (48 h)  
- **Daphnia magna EC_{50}:** > 22 mg/L (48 h)

**Mode of Action**

**What happens after application?**

Tolpyralate is rapidly absorbed by leaf and stem tissue and works by disrupting an essential function in the plants physiology. Once absorbed by the plant Tolpyralate blocks the production of the HPPD (4-hydroxyphenylpyruvate dioxygenase) enzyme. This inhibits the plants ability to produce plastoquinone and alpha-tocopherol compounds. Without these compounds the formation of carotenoid pigments is interrupted causing the destruction of chlorophyll by sunlight, which is lethal to susceptible weeds. While complete weed death can take up to two weeks, once treated the weeds no longer compete with the growing corn.

**Selectivity**

Corn plants can rapidly break down Tolpyralate into non-toxic substances, therefore it has excellent crop safety for all types of corn.

**Application**

**Use**

Post-emergence application of Tolpyralate controls a wide range of broadleaf weeds and grass weeds. Tolpyralate helps you to fight problematic weeds in your corn field with low use rates of 30-50° g a.i./ha.

*Appropriate dose rate is defined to fit your location and weed species. Follow the label instructions in your country.

**Product**

**Trade Names**

BRUCIA, SHIELDEX, RAKER, RAKER PRO etc.

**Formulations**

40%SC, 10%OD etc.

**Registered Countries**

- Asia: Japan, Korea, Philippines
- Americas: Argentina, Canada, Chile, Mexico, USA

Always read and follow the product label instructions in your country.
**Characteristics**

- HRAC Group 27
- Mode of action: Inhibition of 4-hydroxyphenylpyruvate dioxygenase (HPPD) enzyme
- Excellent safety for all types of corn (field corn, sweet corn, popcorn, seed corn)
- Controls a wide range of broadleaf weeds and annual grass weeds including difficult control weeds, such as *Amaranthus* spp, *Setaria* spp.
- Low-use formulation with application rates between 30 to 50 g a.i./ha.
- Effective for weeds resistant to other herbicide modes of actions including glyphosate and ALS inhibitors, including *Amaranthus tuberculatus*, *Ambrosia trifida* and *Erigeron canadensis*.
- Excellent tank-mix partner with other commonly used herbicides such as chloroacetamides, glyphosate, glufosinate, atrazine, dicamba.

**Visual Effect of Herbicidal Activity - Tolpyralate Treated Corn Field-**

14 days after application

28 days after application

**Weed Spectrum**

<table>
<thead>
<tr>
<th>Family</th>
<th>Weed Spectrum</th>
<th>Scientific Name</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poaceae</td>
<td>Grass weeds</td>
<td><em>Digitaria sanguinalis</em></td>
<td>Large crabgrass</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Echinochloa crus-galli</em></td>
<td>Barnyardgrass</td>
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<tr>
<td></td>
<td></td>
<td><em>Eleusine indica</em></td>
<td>Goosegrass</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Setaria faberi</em></td>
<td>Giant foxtail</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Setaria pumila</em></td>
<td>Yellow foxtail</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Setaria viridis</em></td>
<td>Green foxtail</td>
</tr>
<tr>
<td>Amaranthaceae</td>
<td>Broadleaf weeds</td>
<td><em>Amaranthus palmeri</em></td>
<td>Palmer amaranth</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Amaranthus tuberculatus</em></td>
<td>Waterhemp</td>
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<tr>
<td></td>
<td></td>
<td><em>Bassia scoparia</em></td>
<td>Kochia</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Chenopodium album</em></td>
<td>Common lambsquarters</td>
</tr>
<tr>
<td>Asteraceae</td>
<td></td>
<td><em>Ambrosia artemisiifolia</em></td>
<td>Common ragweed</td>
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<tr>
<td></td>
<td></td>
<td><em>Ambrosia trifida</em></td>
<td>Giant ragweed</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Erigeron canadensis</em></td>
<td>Horseweed</td>
</tr>
<tr>
<td>Brassicaceae</td>
<td></td>
<td><em>Raphanus sativus</em></td>
<td>Wild radish</td>
</tr>
<tr>
<td>Caryophyllaceae</td>
<td></td>
<td><em>Stefaria media</em></td>
<td>Common chickweed</td>
</tr>
<tr>
<td>Lamiaceae</td>
<td></td>
<td><em>Lamium amplexicaule</em></td>
<td>Henbit</td>
</tr>
<tr>
<td>Malvaceae</td>
<td></td>
<td><em>Abutilon theophrasti</em></td>
<td>Velvetleaf</td>
</tr>
<tr>
<td>Molluginaceae</td>
<td></td>
<td><em>Molugo verticillata</em></td>
<td>Carpetweed</td>
</tr>
<tr>
<td>Polygonaceae</td>
<td></td>
<td><em>Polygonum aviculare</em></td>
<td>Prostrate knotweed</td>
</tr>
<tr>
<td>Solanaceae</td>
<td></td>
<td><em>Solanum nigrum</em></td>
<td>Black nightshade</td>
</tr>
</tbody>
</table>

and more