**MOBILITY**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Reference</th>
<th>Value Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Solubility (mg/L)</td>
<td>10</td>
<td>2</td>
<td>Low</td>
</tr>
<tr>
<td>Soil Sorption (Kd=mL/g)</td>
<td>Value not found</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic Sorption (Koc=mL/g)</td>
<td>1,100</td>
<td>2</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

**Mobility Summary:**
Capsaicin is not very soluble in water and adheres moderately to soil. The hazard to move off the site of application with water is moderate.

**PERSISTENCE**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Reference</th>
<th>Value Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vapor Pressure (mm Hg)</td>
<td>&quot;Very low&quot;</td>
<td>2</td>
<td>High</td>
</tr>
<tr>
<td>Biotic or Aerobic Half-life (days)</td>
<td>2 to &gt;14</td>
<td>2 and 5</td>
<td>Low to moderate</td>
</tr>
<tr>
<td>Abiotic Half-life (days)</td>
<td>No photolysis or hydrolysis</td>
<td>2</td>
<td>High</td>
</tr>
<tr>
<td>Terrestrial Field Test Half-life (days)</td>
<td>Value not found</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrolysis Half-life (days)</td>
<td>Value not found</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anaerobic Half-life (days)</td>
<td>Value not found</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquatic Field Test Half-life (days)</td>
<td>Value not found</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Persistence Summary:**
Capsaicin is an oily resin that is not water soluble and is not expected to dissipate into the air after application. Testing with sandy loam soil estimated that capsaicin is likely to degrade to half of the applied concentration within one week, however, the study indicated that the capsaicin may have leached into the soil after application instead of breaking down (Reference 2). Another study indicated that the amount of water placed on the treated soil increased the rate of degradation and when there was no water the degradation half-life was greater than 14 days. The hazard for persistence is rated moderate (likely to take between one week and 60 days to degrade to half of the applied concentration).

**BIOACCUMULATION**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Reference</th>
<th>Value Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioaccumulation Factor</td>
<td>Value not found</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bioconcentration Factor</td>
<td>Value not found</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Octanol/Water Partition Coefficient</td>
<td>log Kow = 3</td>
<td>2</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

**Bioaccumulation Summary:**
The octanol / water partition coefficient of capsaicin (log Kow = 3) indicates that it binds to oil and fat and may accumulate in fish or animal tissue. Metabolism testing with rats indicates that capsaicin is quickly distributed to the blood, spinal cord tissue, kidneys and liver, however, it was not detectable in any tissue 17 hours after administration (Reference 2). The hazard for bioaccumulation is rated low.
### ACUTE WILDLIFE TOXICITY VALUES and Risk Assessment

<table>
<thead>
<tr>
<th>Test Subject</th>
<th>Value</th>
<th>Reference</th>
<th>Value Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mammalian (LD50)</td>
<td>97.4 mg/kg</td>
<td>1</td>
<td>Moderate</td>
</tr>
<tr>
<td>Avian (LD50)</td>
<td>Data waived by EPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Honey bee or insect (LD50)</td>
<td>&gt;100 ug/bee</td>
<td>3</td>
<td>Low</td>
</tr>
<tr>
<td>Annelida -worms (LC50)</td>
<td>Data waived by EPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fish (LC50)</td>
<td>Data waived by EPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crustacean (LC50)</td>
<td>Data waived by EPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mollusk (LC50)</td>
<td>Data waived by EPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amphibian (LD50 or LC50)</td>
<td>Data waived by EPA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Acute Toxicity Testing and Ecotoxicity Summary:

The EPA believes that because capsaicin is such an effective repellent based on its strong irritant properties to the skin or when eaten, that exposures to non-target species would be small enough to waive exposure risk assessments (Reference 1). Bird feeding studies indicate that birds do not have the ability to detect “hot” spice in their diet and were not repelled from eating a diet containing capsaicin. Capsaicinoid chemicals may be a natural defense evolved within plants to allow seed dispersal by birds (promoting dispersal and germination) while protecting them from animals and insects. The hazard and risk to fish and other aquatic organisms is unknown, so, the EPA required products to contain a warning that they may be toxic to fish and to not apply them or allow them to runoff into waterbodies (Reference 1). Oral toxicity testing with honeybees indicates that it is low in toxicity (Reference 3), however it has insecticidal activity indicating that it may be toxic to other non-target beneficial insects. The hazard to non-target wildlife is rated low.

#### ACUTE HUMAN TOXICITY - Risk Assessment

<table>
<thead>
<tr>
<th>Subject and Scenario</th>
<th>Route</th>
<th>Dose of Concern</th>
<th>Exposure</th>
<th>Margin of Safety</th>
<th>Reference</th>
<th>Value Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-term exposure risk was not evaluated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-term exposure risk was not evaluated</td>
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</tbody>
</table>

#### Acute Toxicity Risk Assessment Summary:

The EPA determined that the risks to humans from occupational or dietary exposures to capsaicin from pesticidal uses are negligible (Reference 1). The risk is considered low because red pepper has been used as a food item without incident throughout history and is not known to cause toxicity.
# CHRONIC HUMAN TOXICITY HAZARDS

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Adverse Effect</th>
<th>Reference</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carcinogenicity</td>
<td>Not evaluated by EPA or IARC</td>
<td>&quot;Inconclusive&quot; and &quot;anticarcinogenic&quot;</td>
<td>2 and 4</td>
<td>Not rated</td>
</tr>
<tr>
<td>Mutagenicity</td>
<td>Inhibition of xenobiotic metabolizing enzymes</td>
<td>&quot;Antimutagenic&quot;</td>
<td>4</td>
<td>Low</td>
</tr>
<tr>
<td>Neurotoxicity - (NOAEL)</td>
<td>NOAEL / LOAEL data not found</td>
<td>Stimulates pain fibers / release somatostatin</td>
<td>4</td>
<td>Not rated</td>
</tr>
<tr>
<td>Endocrine Disruption</td>
<td>NOAEL / LOAEL data not found</td>
<td>Potential hypoglycemia</td>
<td>4</td>
<td>Not rated</td>
</tr>
<tr>
<td>Developmental Toxicity (NOAEL)</td>
<td>NOAEL / LOAEL data not found</td>
<td>Delayed ossification of metatarsal bones</td>
<td>2</td>
<td>Low</td>
</tr>
<tr>
<td>Reproductive Toxicity (NOAEL)</td>
<td>NOAEL / LOAEL data not found</td>
<td>Fewer pregnancies &amp; matings</td>
<td>4</td>
<td>Not rated</td>
</tr>
<tr>
<td>Chronic Toxicity (NOAEL)</td>
<td>NOAEL / LOAEL data not found</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Chronic Toxicity Hazard Summary:**

Long-term toxicity testing with rodents produced weight loss or no effects at all and rabbits displayed spleen and liver toxicity although there was no determination of the Lowest Observeable Adverse Effect Level (LOAEL) or No Observeable Adverse Effect Level (NOAEL) for toxic effects (Reference 2). The evidence of carcinogenicity is inconclusive and the EPA and the International Agency on the Research of Cancer have not evaluated its carcinogenic potential (Reference 2). Review of toxicity studies compiled by the Library of Medicine states that capsaicin may have anticarcinogenic and antimutagenic properties (Reference 4). Carcinogenic potential is not rated for this review based on lack of a scientific evaluation. Reproductive and developmental toxicities were observed after maternal toxicity which is not considered either high in hazard or moderate in hazard. Endocrine system effects with test animals (not humans) suggest that it may induce hypoglycemia (Reference 4).

## CHRONIC HUMAN TOXICITY - Risk Assessment

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<th>Exposure</th>
<th>Margin of Safety</th>
<th>Reference</th>
<th>Value</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-term exposure risks</td>
<td>were not evaluated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long-term exposure risks</td>
<td>were not evaluated</td>
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<td>Long-term exposure risks</td>
<td>were not evaluated</td>
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</tbody>
</table>

**Chronic Toxicity Risk Assessment Summary:**

Risk assessments for the potential to cause toxicity in humans from long-term exposures to capsaicin from pesticidal uses were not required by the EPA and were not available from any other source. Long-term exposures to capsaicin is not expected from pesticidal uses and are rated low in hazard because food uses of capsaicin have not reported any toxicities and pesticidal uses are expected to be smaller than dietary exposures.

### Metabolites and Degradation Products:

Capsaicin is produced by grinding red peppers to a powder and then extracting the resin by soaking it in hexane, filtering it and then evaporating the hexane leaving an oily resin. The resulting resin is not supposed to contain more than 25 parts per million hexane.

In soil, capsaicin is metabolized to vanillylamine, which is further broken down into vanillin, vanillyl alcohol and vanillic acid (Reference 2).

### Comments:

Capsaicin can be a severe eye irritant and is a skin irritant (Reference 2).

### References