Monsanto Company, Lawn & Garden Products
Material Safety Data Sheet
Commercial Product

1. PRODUCT AND COMPANY IDENTIFICATION

Product name
Roundup® Weed & Grass Killer Concentrate Plus

EPA Reg. No.
71995-29

Chemical name
Not applicable

Synonyms
None

Company
Monsanto Company, Lawn & Garden Products, P.O. Box 1750, Columbus, OH, 43216
Telephone: 1-888-ROUNDUP (888-768-6387)

Emergency numbers
FOR CHEMICAL EMERGENCY, SPILL LEAK, FIRE, EXPOSURE, OR ACCIDENT Call CHEMTREC - Day or Night: 1-800-424-9300 toll free in the continental U.S., Puerto Rico, Canada, or Virgin Islands. For calls originating elsewhere: 703-527-3887 (collect calls accepted).
FOR MEDICAL EMERGENCY - Day or Night: 1-888-768-6387

2. COMPOSITION/INFORMATION ON INGREDIENTS

Active ingredient
- Isopropylamine salt of N-(phosphonomethyl)glycine; {Isopropylamine salt of glyphosate}
- 1,1-Ethylene-2,2-bipyridinium dibromide; {Diquat dibromide}

Composition

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>CAS No.</th>
<th>% by weight (approximate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopropylamine salt of glyphosate</td>
<td>38641-94-0</td>
<td>18</td>
</tr>
<tr>
<td>Diquat dibromide</td>
<td>85-00-7</td>
<td>0.73</td>
</tr>
<tr>
<td>Other ingredients</td>
<td></td>
<td>81.27</td>
</tr>
</tbody>
</table>

The specific chemical identity is being withheld because it is trade secret information of Monsanto Company.

OSHA Status
This product is hazardous according to the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

3. HAZARDS IDENTIFICATION

Emergency overview
Appearance and odour (colour/form/odour): Amber / Liquid / Musky

CAUTION!
CAUSES MODERATE EYE IRRITATION

Potential health effects
Likely routes of exposure
- Skin contact, eye contact, inhalation
Eye contact, short term
- Causes temporary eye irritation.
Skin contact, short term
Not expected to produce significant adverse effects when recommended use instructions are followed.

Inhalation, short term
Not expected to produce significant adverse effects when recommended use instructions are followed.

Refer to section 11 for toxicological and section 12 for environmental information.

4. FIRST AID MEASURES

Eye contact
If in eyes, hold eye open and rinse slowly and gently for 15-20 minutes. Remove contact lenses, if present, after first 5 minutes, then continue rinsing.

Skin contact
Wash affected skin with plenty of water.
Take off contaminated clothing, wristwatch, jewellery.
Wash clothes before re-use.

Inhalation
Remove to fresh air.

Advice to doctors
This product is not an inhibitor of cholinesterase.

Antidote
Treatment with atropine and oximes is not indicated.

5. FIRE-FIGHTING MEASURES

Flash point
Does not flash.

Extinguishing media
Recommended: Water, dry chemical, foam, carbon dioxide (CO2)

Unusual fire and explosion hazards
None.
Environmental precautions: see section 6.

Hazardous products of combustion
Carbon monoxide (CO), nitrogen oxides (NOx), phosphorus oxides (PxoY), hydrogen bromide (HBr)

Fire fighting equipment
Self-contained breathing apparatus.
Equipment should be thoroughly decontaminated after use.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protection recommended in section 8.

Environmental precautions
SMALL QUANTITIES:
Low environmental hazard.
LARGE QUANTITIES:
Minimise spread.
Methods for cleaning up
SMALL QUANTITIES:
Flush spill area with water.
LARGE QUANTITIES:
Absorb in earth, sand or absorbent material.
Dig up heavily contaminated soil.
Collect in containers for disposal.
Refer to section 7 for types of containers.
Flush residues with small quantities of water.
Minimise use of water to prevent environmental contamination.

Refer to section 13 for disposal of spilled material.

7. HANDLING AND STORAGE

Good industrial practice in housekeeping and personal hygiene should be followed.

Handling
Avoid contact with eyes.
When using do not eat, drink or smoke.
Wash hands thoroughly after handling or contact.
Do not contaminate drains, sewers and water ways when disposing of equipment rinse water.
Emptied packages retain product residue and dust.
Observe all labelled safeguards until container is cleaned, reconditioned or destroyed.

Storage
Compatible materials for storage: stainless steel, aluminium, fibreglass, plastic, glass lining
Incompatible materials for storage: galvanised steel, unlined mild steel, see section 10.
Keep out of reach of children.
Keep away from food, drink and animal feed.
Keep only in the original container.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Airborne exposure limits

<table>
<thead>
<tr>
<th>Components</th>
<th>Exposure Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopropylamine salt of glyphosate</td>
<td>No specific occupational exposure limit has been established.</td>
</tr>
<tr>
<td>Diquat dibromide</td>
<td>TLV (ACGIH): 0.5 mg/m3: inhalable fraction, skin, No specific occupational exposure limit has been established., The exposure limit indicated is for the diquat cation. TLV (ACGIH): 0.1 mg/m3: respirable fraction, skin, No specific occupational exposure limit has been established., The exposure limit indicated is for the diquat cation. PEL (OSHA): No specific occupational exposure limit has been established.</td>
</tr>
<tr>
<td>Other ingredients</td>
<td>No specific occupational exposure limit has been established.</td>
</tr>
</tbody>
</table>

Engineering controls
Provide adequate ventilation to keep airborne concentration below exposure limits.

Eye protection
If there is significant potential for contact:
Wear chemical goggles.

**Skin protection**
- No special requirement when used as recommended.
- If repeated or prolonged contact:
  - Wear chemical resistant gloves.

**Respiratory protection**
- If airborne exposure is excessive:
  - Wear respirator.
  - Full facepiece/hood/helmet respirator replaces need for chemical goggles.

When recommended, consult manufacturer of personal protective equipment for the appropriate type of equipment for a given application.

### 9. PHYSICAL AND CHEMICAL PROPERTIES

These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specifications for the product.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour/colour range</td>
<td>Amber</td>
</tr>
<tr>
<td>Form</td>
<td>Liquid</td>
</tr>
<tr>
<td>Odour</td>
<td>Musky</td>
</tr>
<tr>
<td>Flash point</td>
<td>Does not flash</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>1.074 °C / 15.6 °C</td>
</tr>
<tr>
<td>Solubility</td>
<td>Water: Soluble</td>
</tr>
</tbody>
</table>

### 10. STABILITY AND REACTIVITY

**Stability**
- Stable under normal conditions of handling and storage.

**Hazardous decomposition**
- Thermal decomposition: Hazardous products of combustion: see section 5.

**Materials to avoid/Reactivity**
- Reacts with galvanised steel or unlined mild steel to produce hydrogen, a highly flammable gas that could explode.

### 11. TOXICOLOGICAL INFORMATION

This section is intended for use by toxicologists and other health professionals.

Monsanto has not conducted toxicity studies on this product. Data obtained on similar products and on components are summarized below.

**Similar formulation**

**Acute oral toxicity**
- Rat, LD50: > 5,000 mg/kg body weight
- Practically non-toxic
- FIFRA category IV

**Acute dermal toxicity**
- Rat, LD50: > 5,000 mg/kg body weight
- Practically non-toxic
FIFRA category IV.

**Skin irritation**
- Rabbit, 3 animals, OECD 404 test:
  - Days to heal: 2
  - Primary Irritation Index (PII): 0.4/8.0
  - Essentially non irritating.
  - FIFRA category IV.

**Eye irritation**
- Rabbit, 3 animals, OECD 405 test:
  - Days to heal: 3
  - FIFRA category III.
  - Moderate irritation.

**Acute inhalation toxicity**
- Rat, LC50, 4 hours, aerosol:
  - Practically non-toxic.
  - FIFRA category IV.
  - No 4-hr LC50 at the maximum tested concentration.

**Skin sensitization**
- Guinea pig, Buehler test:
  - Positive incidence: 0 %
  - Negative.

**N-(phosphonomethyl)glycine; [glyphosate]**

**Mutagenicity**
- In vitro and in vivo mutagenicity test(s):
  - Not mutagenic.

**Repeated dose toxicity**
- Rabbit, dermal, 21 days:
  - NOAEL toxicity: > 5,000 mg/kg body weight/day
  - Target organs/systems: none
  - Other effects: none

- Rat, oral, 3 months:
  - NOAEL toxicity: > 20,000 mg/kg diet
  - Target organs/systems: none
  - Other effects: none

**Carcinogenicity**
- Mouse, oral, 24 months:
  - NOEL tumour: > 30,000 mg/kg diet
  - NOAEL toxicity: ~ 5,000 mg/kg diet
  - Tumours: none
  - Target organs/systems: liver
  - Other effects: decrease of body weight gain, histopathologic effects

- Rat, oral, 24 months:
  - NOEL tumour: > 20,000 mg/kg diet
  - NOAEL toxicity: ~ 8,000 mg/kg diet
  - Tumours: none
  - Target organs/systems: eyes
  - Other effects: decrease of body weight gain, histopathologic effects

**Toxicity to reproduction/fertility**
- Rat, oral, 3 generations:
  - NOAEL toxicity: > 30 mg/kg body weight
  - NOAEL reproduction: > 30 mg/kg body weight
  - Target organs/systems in parents: none
  - Other effects in parents: none
  - Target organs/systems in pups: none
  - Other effects in pups: none
Developmental toxicity/teratogenicity

**Rat, oral, 6 - 19 days of gestation:**
- NOAEL toxicity: 1,000 mg/kg body weight
- NOAEL development: 1,000 mg/kg body weight
- Other effects in mother animal: decrease of body weight gain, decrease of survival
- Developmental effects: weight loss, post-implantation loss, delayed ossification
- Effects on offspring only observed with maternal toxicity.

**Rabbit, oral, 6 - 27 days of gestation:**
- NOAEL toxicity: 175 mg/kg body weight
- NOAEL development: 175 mg/kg body weight
- Target organs/systems in mother animal: none
- Other effects in mother animal: decrease of survival
- Developmental effects: none

Diquat dibromide

**Mutagenicity**

**Ames test(s):**
- Not mutagenic without metabolic activation.

**Micronucleus test(s):**
- Not mutagenic.

**Dominant lethal test(s):**
- Not mutagenic.

**In vitro chromosomal aberration test(s):**
- Not mutagenic.

**Mammalian cell mutagenicity test(s):**
- Mutagenic with and without metabolic activation.

**In vitro chromosomal aberration test(s):**
- Mutagenic.

Repeated dose toxicity

**Rat, inhalation, 3 weeks:**
- NOEL toxicity: 0.1 mg/m3
- Target organs/systems: lung
- Other effects: organ weight change, histopathologic effects, local irritation

Carcinogenicity

**Dog, oral, 52 weeks:**
- NOAEL toxicity: 0.5 mg/kg body weight/day
- Target organs/systems: eyes, adrenals
- Other effects: organ weight change

**Rat, oral, 2 years:**
- NOEL tumour: 2.91 mg/kg body weight/day
- NOAEL toxicity: 0.58 mg/kg body weight/day
- Tumours: bone marrow (sarcoma)
- Target organs/systems: eyes
- Tumours not related to treatment.

**Mouse, oral, 2 years:**
- NOEL tumour: > 37.8 mg/kg body weight/day
- NOAEL toxicity: 3.56 mg/kg body weight/day
- Tumours: none
- Target organs/systems: kidneys
- Other effects: decrease of body weight gain, organ weight change

Toxicity to reproduction/fertility

**Rat, oral, 2 generations:**
- NOEL toxicity: 0.8 mg/kg body weight/day
- NOEL reproduction: 4 mg/kg body weight/day
- Target organs/systems in parents: eyes
- Other effects in parents: decrease of body weight gain, decrease of food consumption
Other effects in pups: decrease of body weight gain, decrease of litter survival 
Effects on offspring only observed with maternal toxicity.

**Developmental toxicity/teratogenicity**

**Rat, oral, 7 - 16 days of gestation:**
- NOEL toxicity: < 4 mg/kg body weight/day
- NOEL development: 12 mg/kg body weight/day
- Other effects in mother animal: decrease of body weight gain, decrease of food consumption
- Developmental effects: weight loss, skeletal variations, visceral malformations, delayed ossification
- Effects on offspring only observed with maternal toxicity.

**Rabbit, oral, 7 - 19 days of gestation:**
- NOEL toxicity: 1 mg/kg body weight/day
- NOEL development: 3 mg/kg body weight/day
- Other effects in mother animal: decrease of body weight gain, decrease of food consumption
- Developmental effects: visceral variations, delayed ossification
- Effects on offspring only observed with maternal toxicity.

**Mouse, oral, 6 - 15 days of gestation:**
- NOEL toxicity: 1 mg/kg body weight/day
- NOEL development: 2 mg/kg body weight/day
- Other effects in mother animal: decrease of body weight gain, breathing irregularities, neurotoxic signs, decrease of survival
- Developmental effects: weight loss, skeletal variations
- Effects on offspring only observed with maternal toxicity.

**Acute neurotoxicity**

**Rat, oral, single dose, gavage:**
- NOEL: 25 mg/kg body weight
- Other effects: neuromuscular effects
- Not neurotoxic.

**Repeated dose neurotoxicity**

**Rat, oral, 14 weeks, dietary:**
- NOAEL: 8 mg/kg body weight/day
- Target organs/systems: eyes
- Other effects: decrease of body weight gain
- Not neurotoxic.

**12. ECOLOGICAL INFORMATION**

This section is intended for use by ecotoxicologists and other environmental specialists.

Data obtained on similar products and on components are summarized below.

**Similar formulation**

**Aquatic toxicity, fish**

**Rainbow trout (Oncorhynchus mykiss):**
- Acute toxicity, 96 hours, static, LC50: 5.4 mg/L
- Moderately toxic.

**Bluegill sunfish (Lepomis macrochirus):**
- Acute toxicity, 96 hours, static, LC50: 7.3 mg/L
- Moderately toxic.

**Aquatic toxicity, invertebrates**

**Water flea (Daphnia magna):**
- Acute toxicity, 48 hours, static, EC50: 11 mg/L
- Slightly toxic.

**Avian toxicity**

**Mallard duck (Anas platyrhynchos):**
- Dietary toxicity, 5 days, LC50: > 5,620 mg/kg diet
Practically non-toxic.

**Bobwhite quail (Colinus virginianus):**
Dietary toxicity, 5 days, LC50: > 5,620 mg/kg diet
Practically non-toxic.

**Arthropod toxicity**

**Honey bee (Apis mellifera):**
Oral/contact, 48 hours, LD50: > 100 µg/bee
Practically non-toxic.

**Soil organism toxicity, invertebrates**

**Earthworm (Eisenia fetida):**
Acute toxicity, 14 days, LC50: > 1,250 mg/kg soil
Practically non-toxic.

**Isopropylamine salt of glyphosate (62%)**

**Aquatic toxicity, algae/aquatic plants**

**Green algae (Scenedesmus subspicatus):**
Acute toxicity, 72 hours, static, ErC50 (growth rate): 166 mg/L
Practically non-toxic.

**N-(phosphonomethyl)glycine (glyphosate)**

**Bioaccumulation**

**Bluegill sunfish (Lepomis macrochirus):**
Whole fish: BCF: < 1
No significant bioaccumulation is expected.

**Dissipation**

**Soil, field:**
Half life: 2 - 174 days
Koc: 884 - 60,000 L/kg
Adsorbs strongly to soil.

**Water, aerobic:**
Half life: < 7 days

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13. **DISPOSAL CONSIDERATIONS**

**Product**
Keep out of drains, sewers, ditches and water ways.
Recycle if appropriate facilities/equipment available.
Burn in proper incinerator.
Follow all local/regional/national/international regulations.

**Container**
See the individual container label for disposal information.
Emptied packages retain product residue and dust.
Observe all labelled safeguards until container is cleaned, reconditioned or destroyed.
Empty packaging completely.
Triple or pressure rinse empty containers.
Do NOT contaminate water when disposing of rinse waters.
Ensure packaging cannot be reused.
Do NOT re-use containers.
Store for collection by approved waste disposal service.
Recycle if appropriate facilities/equipment available.
Follow all local/regional/national/international regulations.

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14. **TRANSPORT INFORMATION**
The data provided in this section is for information only. Please apply the appropriate regulations to properly classify your shipment for transportation.

Not hazardous under the applicable DOT, ICAO/IATA, IMO, TDG and Mexican regulations.

15. REGULATORY INFORMATION

TSCA Inventory
Exempt

OSHA Hazardous Components
Diquat dibromide
Surfactant

SARA Title III Rules
Section 311/312 Hazard Categories
Immediate
Section 302 Extremely Hazardous Substances
Not applicable.
Section 313 Toxic Chemical(s)
Not applicable.

CERCLA Reportable quantity
Not applicable.

16. OTHER INFORMATION

The information given here is not necessarily exhaustive but is representative of relevant, reliable data. Follow all local/regional/national/international regulations. Please consult supplier if further information is needed.

In this document the British spelling was applied.

Full denomination of most frequently used acronyms. BCF (Bioconcentration Factor), BOD (Biochemical Oxygen Demand), COD (Chemical Oxygen Demand), EC50 (50% effect concentration), ED50 (50% effect dose), I.M. (intramuscular), I.P. (intraperitoneal), I.V. (intravenous), Koc (Soil adsorption coefficient), LC50 (50% lethality concentration), LD50 (50% lethality dose), LEL (Lower Explosion Limit), LOAEC (Lowest Observed Adverse Effect Concentration), LOAEL (Lowest Observed Adverse Effect Level), LOEC (Lowest Observed Effect Concentration), LOEL (Lowest Observed Effect Level), MEL (Maximum Exposure limit), MTD (Maximum Tolerated Dose), NOAEC (No Observed Adverse Effect Concentration), NOAEL (No Observed Adverse Effect Level), NOEC (No Observed Effect Concentration), NOEL (No Observed Effect Level), OEL (Occupational Exposure Limit), PEL (Permissible Exposure Limit), PII (Primary Irritation Index), Pow (Partition coefficient n-octanol/water), S.C. (subcutaneous), STEL (Short-Term Exposure Limit), TLV-C (Threshold Limit Value - Ceiling), TLV-TWA (Threshold Limit Value - Time Weighted Average), UEL (Upper Explosion Limit)

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