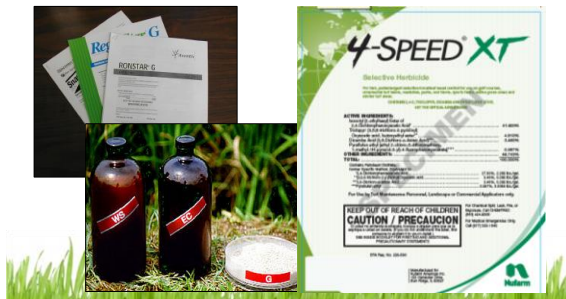


Understanding Herbicide Labels, Formulations, and Adjuvants



Parts of a Pesticide Label

1. Product name
2. Type of pesticide
3. Ingredient statement
4. Keep out of reach of children
5. Signal word
6. Stmt. of practical treatment
7. Note to physician
8. Precautionary statements
9. Directions for use

Hazards to humans and domestic animals
Personal protective equipment (PPE)
User safety recommendations
Environmental hazards
First aid

Legal statement
Agricultural use requirements
Nonagricultural use requirements
Use precautions
Spray drift management
Weeds controlled
Mixing instructions
Recommendations by site
Storage and disposal



#1 →

#2 → For use as a preemergence weed control herbicide in turfgrass, landscape or grounds maintenance, noncropland areas, and ornamental production

#3 → Active Ingredient: pendimethalin, N-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzamide 38.7%
Other Ingredients: 61.3%
Total: 100.0%
1 gallon contains 3.8 lbs of nonconcentrated pendimethalin in an aqueous carrier.

#4 →

#5 →

Signal Word



Product is highly toxic and potentially deadly at low doses. Note: the words "Danger-Poison" will always contain red text. N/A for T&O HERBICIDES



Products are corrosive and can cause irreversible eye damage or severe skin injury.



Products are moderately toxic or can cause moderate eye or skin irritation.



Products are slightly toxic or may cause slight eye or skin irritation.

Check precautionary statements to determine if eye, skin, or illness is a concern.

Precautionary Statements

HAZARDS TO HUMANS AND DOMESTIC ANIMALS
WARNING / AVISO
Causes substantial but temporary eye injury. Harmful if inhaled. Harmful if swallowed or absorbed through skin. Do not get in eyes or on clothing. Avoid contact with skin.

PERSONAL PROTECTIVE EQUIPMENT (PPE):
Some materials that are chemically resistant to this product are made of barrier materials, butyl rubber, nitrile rubber or polyethylene. If you wear more options, follow the instructions for category I for an EPA chemical-resistance category selection chart.
All users, loaders, applicators and other handlers must wear:
• long-sleeved shirt and long pants,
• shoes and socks,
• protective eyewear (face shield, goggles or safety glasses),
• chemical-resistant gloves,
• chemical-resistant apron when mixing or loading, cleaning up spills or equipment, or otherwise exposed to the concentrate.

USER SAFETY RECOMMENDATIONS
Users should:
• Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
• Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing if pesticide gets on skin, wash immediately with soap and water.
• Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

ENVIRONMENTAL HAZARDS
This pesticide may be toxic to fish and aquatic invertebrates. Do not apply directly to water, to areas where surface water is present, or to wetland areas below the mean high water mark. DRift also runoff may be hazardous to aquatic organisms in water adjacent to treated areas. Do not contaminate water when disposing of equipment, empty containers or treated materials.
This product has properties and characteristics associated with chemicals detected in groundwater. The use of this product in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination. Application around a cistern or well may result in contamination of drinking water or aquifers.

FIRST AID
IF IN EYES: Rinse continuously with water for at least 15 minutes. If irritation persists, get medical attention. If possible, after the first 5 minutes, then continue rinsing eye.
IF SWALLOWED: Do not induce vomiting unless directed to do so by medical personnel. Follow these instructions: Rinse mouth with water. Do not eat, drink, or use tobacco until you have been examined by a physician.
IF ON SKIN OR CLOTHING: Wash thoroughly with soap and water for 15 to 20 minutes. Do not use petroleum solvents or other treatment solvents.

Gramoxone (Paraquat) – Most Toxic of All Herbicides



Active Ingredient:
Paraquat dichloride (1,1'-dimethyl-4,4'-bipyridinium dichloride) 30.1%
Other Ingredients: 69.9%
Total: 100.0%


Contains 2.0 pounds paraquat cation per gallon as a 2-1/2 ounce wet use solution.
Contains bleaching agent (sodium), wettable, dye and thixotropic technology.

RESTRICTED USE PESTICIDE

FOR RETAIL SALE TO AND USE ONLY BY CERTIFIED APPLICATORS OR PERSONS UNDER THEIR DIRECT SUPERVISION AND ONLY FOR THOSE USES COVERED BY THE CERTIFIED APPLICATOR'S CERTIFICATION.

Personal Protective Equipment (PPE)
Applicators and other handlers (other than Mixers and Loaders) must wear:
• Long-sleeved shirt and long pants
• Shoes plus socks
• Protective eyewear
• Chemical Resistant Gloves - Category A (e.g. barrier laminate, butyl rubber, nitrile rubber, neoprene rubber, natural rubber, polyethylene, polyvinyl chloride (PVC) or Viton®)
• A dust mist RESD50 approved respirator with any R, R.E. or HE filter
Mixer and Loaders must wear:
• Long-sleeved shirt and long pants
• Shoes plus socks
• A dust mist NIOSH approved respirator with any R, R.E. or HE filter
• Chemical Resistant Gloves - Category A (e.g. barrier laminate, butyl rubber, nitrile rubber, neoprene rubber, natural rubber, polyethylene, polyvinyl chloride (PVC) or Viton®)
• Chemical resistant apron
• Face shield
Dusted clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them. Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washing, use detergent and hot water. Keep and wash PPE separately from other laundry.

Compare to Gallery (isoxaben), which Carries a Caution Signal Word



CAUTION
Causes Eye Irritation • Harmful if Inhaled
Avoid ingestion, breathing dust or spray mist, and contact with skin, eyes, or clothing.




Personal Protective Equipment (PPE)
Applicators and other handlers must wear:
• Long-sleeved shirt and long pants
• Shoes plus socks

User Safety Recommendations
• Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
• Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

First Aid
• **In eyes:** Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.
• **Inhalation:** Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not get anything in mouth. Rinse mouth with water. If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.
• **Inhaled:** Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-

Are Herbicides Safe?

Product	Oral LD ₅₀
• Kerosene	5
• Gasoline	50
• Nicotine	53
• Paraquat	125
• Caffeine	192
• Diquat	230
• Acetaminophen	338
• Household ammonia	350
• 2,4-D	764
• Aspirin	1240
• MSMA	2833
• Dicamba	2900
• Fenoxaprop	3310
• Table salt	3320
• Glyphosate	4320
• Trifloxysulfuron	>5000
• Ethofumesate	>5000

PCB's, DIOXIN & AGENT ORANGE

Current Debate about Mode of Action Groups

Some herbicides might mention the mode of action to help you in resistance management planning.

Others have voluntarily embraced a Group system that is already in use outside the US.

General Information

Mode of Action

Pendulum® AquaCap™ herbicide is a non-systemic inhibitor that interferes with the plant cellular division or mitosis and cell elongation in the growing points of shoots and roots of susceptible weeds. When susceptible weeds germinate in the treated area, they contact the herbicide and both shoot and root growth stops. Translocation of the herbicide within the plant is limited. Affected weeds die shortly after growth is stopped, usually before emergence from the soil.




Directions for Use

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling. READ ENTIRE LABEL BEFORE USING THIS PRODUCT. USE STRICTLY IN ACCORDANCE WITH LABEL PRECAUTIONARY STATEMENTS AND DIRECTIONS.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard (WPS) at 29 CFR part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about Personal Protective Equipment (PPE) and restricted-entry intervals. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard. Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of all labels.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- coveralls over short-sleeved shirt and short pants,
- chemical-resistant footwear plus socks,
- chemical-resistant gloves made of any waterproof material,
- chemical-resistant headgear for overhead exposure,
- protective eyewear.

NON-AGRICULTURAL USE REQUIREMENTS

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for agricultural pesticides (29 CFR part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.

Do not enter or allow people (or pets) to enter the treated area until sprays have dried.

This product is for use on Ornamental Turf Lawns (Residential, Industrial and Institutional), Parks, Cemeteries, Athletic Fields and Golf Courses (Fairways, Greens, Tees) and on Golf Courses. This product should not be used in or near greenhouses, including high-tunnels.

GENERAL INSTRUCTIONS AND INFORMATION

Do not apply this product through any type of irrigation system.

When Gramoxone Inteon is applied at less than 10 gallons per acre finished spray volume, a drift control or spray deposition additive SHOULD be used. Refer to the additive label for use directions.

Aerial Drift Reduction Advisory Information
(This section is advisory in nature and does not supersede the mandatory label requirements.)

Information on Droplet Size	Swath Adjustment	Application Height
Controlling Droplet Size	Boom Length	Wind
		Temperature and Humidity

ROTATIONAL CROPS
All rotational crops may be planted immediately after the last application of Gramoxone Inteon.

RAINFASTNESS
Because Gramoxone Inteon is rapidly absorbed by the weed foliage, rain occurring 15-30 minutes or more after application will have no effect on the activity of Gramoxone Inteon.

USE OF A NONIONIC SURFACTANT OR CROP OIL CONCENTRATE

Always add one of the following (failure to use one of the following at recommended rates will result in reduced performance of Gramoxone Inteon).

Nonionic Surfactant: Add nonionic surfactant containing 75% or more surface-active agent at a minimum of 0.125% v/v (1 pt./100 gals.), or add a nonionic surfactant containing 50-74% surface-active agent at a minimum of 0.25% v/v (2 pts./100 gals.), of the finished spray volume for ground applications. For aerial applications, add a nonionic surfactant at 0.25% v/v (2 pts./100 gals.) of the finished spray volume.

Crop Oil Concentrate: Add a nonphytotoxic crop oil concentrate or methylated seed oil containing 15-20% approved emulsifier, at 1.0% v/v (1 gal./100 gals.) of the finished spray volume for ground applications. For aerial applications, add 1 pint of crop oil concentrate per acre. Do not use crop oil concentrate when using Gramoxone Inteon for cotton harvest aid.

TANK MIXING FOR IMPROVED BURNDOWN OF DIFFICULT WEEDS AND RESIDUAL WEED CONTROL

Order of Tank Mixing

In general, Gramoxone Inteon tank mixes with other products should be mixed as follows:

1. Fill spray tank 1/2 full with clean water or other approved carriers such as clear liquid fertilizer.
2. Begin tank agitation and continue throughout mixing and spraying.
3. Add dry formulations (WP, DF, etc.) to tank.
4. Add liquid formulations (SC, EC, L, etc.) to tank.
5. Add Gramoxone Inteon to tank.
6. Add nonionic surfactant to tank.
7. Fill remainder of spray tank.

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.

Pesticide Storage

Store at temperatures above 32°F.

Pesticide Disposal

Pesticides wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

Container Disposal

Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

For Bulk/Mini-Bulk Containers - Rseal container and offer for reconditioning, or triple rinse (or equivalent) and offer for recycling or reconditioning, or clean in accordance with manufacturer's instructions.

Where Can You Use This Herbicide?

Some herbicides place site uses just under the name, some place it early in the use directions under General Information, and some require you to check each separate section that describes use directions for each specific site.



Quick Tip! Use the search function [ctrl + F] in Adobe Acrobat to search for sites.



What is the Recommended Rate?

Rates are most often coupled with tables found inside specific site use instructions. Search the terms "rate" or "dosage" in Acrobat or look for weed control tables as you thumb through the pages.

Spot treatments often allow for higher mixed concentrations as it is assumed the entire area is not treated.

Spot Applications: Postemergence spot applications may be made to susceptible weeds in turfgrass that is tolerant to Drive XLRB (see Tables 1 and 2). Apply 1.45 fluid ounces of Drive XLRB per 1000 square feet (0.75 lb ai/a) of treated area. Spray coverage should be uniform and complete. See Table 5 for spot spray risk instructions.

This rate is specific to Poa control at different timings.

Dosage and Timing
For annual bluegrass control Kerb 50WP is applied at the rate of 1 to 3 lb of product (0.5 to 1.5 lb active ingredient) per acre broadcast application. The dosage rate required is dependent on the growth stage of annual bluegrass at time of application. Follow the dosage rate and timing instructions given below.

Annual Bluegrass Growth Stage	Kerb 50WP Lb per Acre* Broadcast Application
Preemergence or early postemergence	1 - 2
Postemergence - early tillering to heading	1.5 - 2
Postemergence - seed forming stages	2 - 3

* One acre equals 43,560 sq. ft.
* Use the higher rate when longer preemergence residual control is desired.

GRASSES (TURF GROWN FOR SEED OR SOO) (Do not use in California)

WEEDS	Amount Per Acre	DIRECTIONS
Annual broadleaf weeds	1 to 1.52 gals*	Apply to established stands before the seed head comes into the boot stage. Do not spray in boot stage of growth. For seedling grasses - apply in the spring after grass has at least 4 leaves, but before boot stage. Premature regrowth may be treated in the fall.
Perennial and biennial weeds	2 to 4 gals*	

* Use only the low rate on seedling grasses.

RESTRICTIONS AND LIMITATIONS FOR GRASSES (TURF GROWN FOR SEED OR SOO)

- Limited to 2 applications per year
- Maximum of 4 gal. (2 lbs. ai) per acre per application
- Minimum of 21 days between applications.

What Does this Herbicide Control?

Look for tables that list weeds controlled. These may be up front in the "Directions for Use" section or separate tables may be found within each site use. These tables may or may not contain use rates. Rates may sometimes be found in the table header or footnotes.



WEEDS CONTROLLED

Common Name	Scientific Name	Preemergence ¹	Postemergence ²
Barnyardgrass	Echinochloa crusgalli	Y	Y
Bentgrass, Creeping	Agrostis stolonifera	Y	Y
Bluegrass, Annual	Poa annua	Suppression	N
Buttercup	Ranunculus scardus	-3	Y
Carpetweed	Mollugo verticillata	Y	Y
Chickweed, Common	Stellaria media	Y	Y
Chickweed, Moosere	Cerastium vulgatum	Y	Y
Clover, Large Hop	Trifolium aureum	Y	Y
Clover, White	Trifolium repens	Y	Y
Crabgrass, Large	Digitaria sanguinalis	Y	Y ⁴
Crabgrass, Smooth	Digitaria ischaemum	Y	Y ⁴
Crabgrass, Southern	Digitaria ciliaris	Y	Y ⁴
Curly dock	Rumex crispus	-	Y

Why are there different formulations?

- Some herbicides cannot be stored in liquid form
- Some herbicides do not mix in water
- Storage, handling, herbicide application needs



Formulations

- Liquid water solubles (S, SL)
- Water-dispersible liquids (L, WDL)
- Soluble powders or granules (SP, WSP, WSG)
- Emulsifiable concentrates (E, EC)
- Wettable powders (W, WP)
- Water-dispersible granules (DG, WDG)
- Granules (G,P, PS)
- Encapsulation

Liquid Formulations

- Liquid water solubles
- Water-dispersible liquids (dry flowables)
 - Small particles suspended in water base. Require agitation. Can settle and clog sprayer.
- Emulsifiable concentrates
 - Emulsifiers wrap around oil-soluble chemicals and suspend them in water. Require agitation.
- Issues
 - Must be protected from freezing
 - Shorter shelf life



Dry Formulations

- Granules
- Water-dispersible granules (Dry Flowables)
 - Herbicides contained within aggregates that dissolve in water
- Soluble powders and Wettable Powders either uncommon or not in use
 - WP were too fine & easily inhaled
- Issues
 - Must be protected from moisture
 - More expensive to apply b/c they contain less AI
 - Difficulty in uniform applications

