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# Paclobutrazol

## HERBICIDE FACT SHEET

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U.S. DEPARTMENT OF ENERGY  
BONNEVILLE POWER ADMINISTRATION

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This fact sheet is one of a series issued by the Bonneville Power Administration for their workers and the general public. It provides information on forest and land management uses, environmental and human health effects, and safety precautions. A list of definitions is included in Section VIII of this fact sheet.

### I. BASIC INFORMATION

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**COMMON NAME:** paclobutrazol

**CHEMICAL NAME:** (R\*,R\*)-(±)-β-[(4-chlorophenyl)methyl]-α-(1,1-dimethylethyl)-1H-1,2,4-triazole-1-ethanol

CAS No. 76738-62-2

**CHEMICAL TYPE:** Information not available.

**PESTICIDE CLASSIFICATION:** Plant Growth Regulator

**REGISTERED USE STATUS:** "General Use."

**FORMULATIONS:** Commercial herbicide products generally contain one or more ingredients. An inert ingredient is anything added to the product other than an active ingredient. Because of concern for human health and the environment, EPA announced its policy on toxic inert ingredients in the Federal Register on April 22, 1987 (52FR13305). This policy focuses on the regulation of inert ingredients. EPA's strategy for implementing this policy included the development of four lists of inerts, based on toxicological concerns. Inerts of toxicological concern were placed on List 1. Potentially toxic inerts/high priority for testing were placed on List 2. Inerts of unknown toxicity were placed on List 3, and inerts of minimal concern were placed on List 4.

The inert ingredients of the paclobutrazol formulations are not classified by the USEPA as inert ingredients of toxicological concerns to humans or the environment.

The contents of the paclobutrazol formulation is listed below:

Profile® 2SC Tree Growth Regulator

Paclobutrazol	21.8%
Inert	78.2%

**RESIDUE ANALYTICAL METHODS:** Information not available.

## II. HERBICIDE USES

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**REGISTERED FORESTRY, RANGELAND AND RIGHT-OF-WAY USES:** Paclobutrazol is registered for the reduction of terminal growth and pruning volume in trees not used for food production on sites such as utility rights-of-way, urban environments, and residential and non-crop areas.

### OPERATIONAL DETAILS:

**TARGET PLANTS:** Paclobutrazol is a non-selective, post-emergent herbicide for control of annual grasses, broadleaf weeds, herbaceous plants, woody shrubs and vines.

**MODE OF ACTION:** Paclobutrazol is a xylem plant growth regulator that slows vegetative growth by inhibiting gibberellin biosynthesis.

**METHOD OF APPLICATION:** Paclobutrazol (as Profile<sup>®</sup>) is applied as a basal soil drench or by soil injection.

### SPECIAL PRECAUTIONS:

**TIMING OF APPLICATION:** Paclobutrazol is a post-emergence growth regulator and is applied anytime after emergence of target plants. Effects may not be noticeable for up to eighteen months.

**DRIFT CONTROL:** Care should be exercised not to overspray or apply the herbicide to adjacent non-target areas. Drift control is achieved by observing weather conditions and following label and sprayer instructions.

**RESTRICTIONS/WARNINGS:** Do not apply this product through any type of irrigation system.

## III. ENVIRONMENTAL EFFECTS/FATE

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### SOIL:

**RESIDUAL SOIL ACTIVITY:** The half-life of paclobutrazol is 200 days, depending on soil type.

**ADSORPTION:** The K(oc) of paclobutrazol is 400.

**PERSISTENCE AND AGENTS OF DEGRADATION:** Information not available.

**METABOLITES/DEGRADATION PRODUCTS AND POTENTIAL ENVIRONMENTAL EFFECTS:**  
Information not available.

### WATER:

**SOLUBILITY:** 35 mg/l at 25 C

**POTENTIAL FOR LEACHING INTO SURFACE AND GROUND WATER:** The product has high potential to leach into surface and ground water.

### AIR:

**VOLATILIZATION:** Paclobutrazol is slightly volatile.

**POTENTIAL FOR BYPRODUCTS FROM BURNING OF TREATED VEGETATION:** Information not available.

## IV. ECOLOGICAL TOXICITY EFFECTS ON NON-TARGET SPECIES

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### MICROORGANISMS:

ACUTE CONTACT TOXICITY: LD<sub>50</sub> (honey bee contact) >100 µg/bee

OVERALL TOXICITY: **Practically Non-Toxic**

PLANTS: Contact will slow the growth of target and non-target trees.

### AQUATIC VERTEBRATES:

ACUTE TOXICITY: LC<sub>50</sub> (rainbow trout 96-hour) 27.8 mg/l

ACUTE TOXICITY: LC<sub>50</sub> (bluegill sunfish 96-hour) 23.6 mg/l

OVERALL TOXICITY: **Slightly Toxic**

### AQUATIC INVERTEBRATES:

ACUTE TOXICITY: LC<sub>50</sub> (*Daphnia Magna* 48-hour) 33.2 mg/l

OVERALL TOXICITY: **Slightly Toxic**

**AQUATIC ESTUARINE/MARINE INVERTEBRATES:** Studies not required by EPA. EPA calculates toxicity will be similar to freshwater invertebrates.

### TERRESTRIAL ANIMALS:

AVIAN ACUTE ORAL TOXICITY: LD<sub>50</sub> (mallard duck) 7913 mg/kg

AVIAN DIETARY TOXICITY: LC<sub>50</sub> (mallard duck) >20,000 mg/kg

AVIAN DIETARY TOXICITY: LC<sub>50</sub> (bobwhite quail) >5000 mg/kg

SMALL MAMMAL ACUTE ORAL TOXICITY: LD<sub>50</sub> >2140 mg/kg

OVERALL TOXICITY: **Practically Non-Toxic**

### BIOACCUMULATION POTENTIAL: LOW POTENTIAL

**THREATENED AND ENDANGERED SPECIES:** Due to the low toxicity and method of application, paclobutrazol is not expected to cause adverse effects to federally listed species.

## V. TOXICOLOGICAL DATA

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### ACUTE TOXICITY:

ACUTE ORAL TOXICITY: LD<sub>50</sub> (rat, female) 1330 mg/kg

ACUTE DERMAL TOXICITY: LD<sub>50</sub> (rabbit) >2000 mg/kg

PRIMARY SKIN IRRITATION: Rabbit - Slightly irritating

PRIMARY EYE IRRITATION: Rabbit - Moderately irritating

**ACUTE INHALATION:** LC<sub>50</sub> (rat 4-hour) >250 mg/l.

**OVERALL TOXICITY: Category III – Caution – Slightly Toxic**

**CHRONIC TOXICITY:**

**CARCINOGENICITY:** No adverse effects.

**DEVELOPMENTAL:** Caused birth defects in lab animals at doses toxic to the mother.

**REPRODUCTIVE:** No adverse effects.

**MUTAGENICITY:** No adverse effects.

**HAZARD:** Harmful if swallowed or absorbed through the skin.

## **VI. HUMAN HEALTH EFFECTS**

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**ACUTE TOXICITY (POISONING):**

**REPORTED EFFECTS:** None reported.

**CHRONIC TOXICITY:**

**REPORTED EFFECTS:** None reported.

**POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM CONTACTING OR CONSUMING TREATED VEGETATION, WATER OR ANIMALS:** None reported.

**POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM INERT INGREDIENTS CONTAINED IN THE FORMULATED PRODUCTS:** Repeated excessive ingestion of propylene glycol may cause central nervous system effects. Commercial bentonite may contain silica gel, which is listed as a potential carcinogen by IARC.

**HEALTH EFFECTS OF EXPOSURE TO FORMULATED PRODUCTS:** Temporary eye irritation. Prolonged or repeated exposure may cause allergic skin reactions and lung effects.

**HEALTH EFFECTS ASSOCIATED WITH CONTAMINANTS:** None reported.

**HEALTH EFFECTS ASSOCIATED WITH OTHER FORMULATIONS:** None reported.

**HEALTH RISK MANAGEMENT PROCEDURES:** See Section VII.

## **VII. SAFETY PRECAUTIONS**

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**SIGNAL WORD AND DEFINITION:**

Paclobutrazol - **CAUTION** – AVOID CONTACT WITH EYES SKIN AND CLOTHING. HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH THE SKIN

**PROTECTIVE PRECAUTIONS FOR WORKERS:** Wear eye protection. Wear long-sleeved shirt, long pants, shoes, socks, and waterproof gloves.

### **MEDICAL TREATMENT PROCEDURES (ANTIDOTES):**

**EYES:** Flush eyes with water; call physician.

**SKIN:** Wash all exposed areas in flowing water or shower. Wash all contaminated clothing prior to reuse. Call a physician if irritation develops.

**INGESTION:** Do not induce vomiting. Call a physician or Poison Control Center. Immediately transport to a medical care facility.

**INHALATION:** Remove individual to fresh air. If breathing difficulty occurs, provide CPR assistance and seek immediate medical attention.

**HANDLING, STORAGE AND DISPOSAL:** Keep dry (below 120° F) and store away from food, feed or other material to be used or consumed by humans or animals. Do not contaminate water. Dispose of only in accordance with local, state and federal regulations.

**EMERGENCY SPILL PROCEDURES AND HAZARDS:** Contain and sweep up material of small spills and dispose as waste. Large spills should be reported to CHEMTREC (800-424-9300) for assistance. Prevent runoff. Do not contaminate water, food, or feed by storage or disposal.

## **VIII. DEFINITIONS**

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**adsorption** – the process of attaching to a surface

**avian** – of, or related to, birds

**CAEPA** – California Environmental Protection Agency

**carcinogenicity** – ability to cause cancer

**CHEMTREC** – Chemical Transportation Emergency Center

**dermal** – of, or related to, the skin

**EC<sub>50</sub>** - median effective concentration during a bioassay

**ecotoxicological** – related to the effects of environmental toxicants on populations of organisms originating, being produced, growing or living naturally in a particular region or environment

**FIFRA** – Federal Insecticide, Fungicide and Rodenticide Act

**formulation** – the form in which the pesticide is supplied by the manufacturer for use

**half-life** – the time required for half the amount of a substance to be reduced by natural processes

**herbicide** – a substance used to destroy plants or to slow down their growth

**Hg** – chemical symbol for mercury

**IARC** – International Agency for Research on Cancer

**K(oc)** – the tendency of a chemical to be adsorbed by soil, expressed as:  $K(oc) = \text{conc. adsorbed}/\text{conc. dissolved}/\% \text{ organic carbon in soil}$

**LC<sub>50</sub>** – the concentration in air, water, or food that will kill approximately 50% of the subjects

**LD<sub>50</sub>** – the dose that will kill approximately 50% of the subjects

**leach** – to dissolve out by the action of water

**mg/kg** – weight ratio expressed as milligrams per kilogram

**mg/l** – weight-to-liquid ratio expressed as milligrams per liter

**microorganisms** – living things too small to be seen without a microscope

**mPa** – milli-Pascal (unit of pressure)  
**mutagenicity** – ability to cause genetic changes  
**NFPA** – National Fire Protection Association  
**NIOSH** - National Institute for Occupational Safety and Health  
**NOEL** - no observable effect level  
**non-target** – animals or plants other than the ones that the pesticide is intended to kill or control  
**OSHA** - Occupational Safety and Health Administration  
**Pa** – Pascal (unit of pressure)  
**persistence** – tendency of a pesticide to remain to remain in the environment after it is applied  
**pesticides** – substances including herbicides, insecticides, rodenticides, fumigants, repellents, growth regulators, etc., regulated under FIFRA  
**PPE** – personal protective equipment  
**ppm** – weight ratio expressed as parts per million  
**residual activity** – the remaining amount of activity as a pesticide  
**T&E** – Threatened and Endangered Species (from the Endangered Species Act)  
**µg** – micrograms  
**volatility** – the tendency to become a vapor at standard temperatures and pressures

## IX. INFORMATION SOURCES

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Cornell University, Pesticide Management Program, Chemical Fact Sheet No. 62: Paclobutrazol, August 14, 1985

<http://pmep.cce.cornell.edu/profiles/index.html>

Dow AgroSciences, Profile® 2SC Specialty Growth Regulator, Specimen Product Label, Label Code: D02-117-007, January 1, 1998

Dow AgroSciences, Profile® 2SC Specialty Growth Regulator, Material Safety Data Sheet, MSDS: 004433, January 1, 1998

EPRI, Determination of the Effectiveness of Herbicide Buffer Zones in Protecting Water Quality, EPRI Final Report TR-113160, 1999

Extension Toxicology Network, Toxicology Information Briefs: Bioaccumulation, Revised 1993, <http://ace.orst.edu/info/extoxnet/tibs/bioaccum.htm>

Spray Drift Task Force, A Summary of Ground Application Studies, 1997  
<http://www.agdrift.com/publications/Body.htm>

## X. TOXICITY CATEGORY TABLES

TABLE I: HUMAN HAZARDS

Category	Signal Word	Route of Administration			Hazard	
		Acute Oral LD <sub>50</sub> (mg/kg)	Acute Dermal LD <sub>50</sub> (mg/kg)	Acute Inhalation LC <sub>50</sub> (mg/l)	Eye irritation	Skin irritation
I (Highly Toxic)	DANGER (poison)	0-50	0-200	0-0.2	corrosive: corneal opacity not reversible within 7 days	corrosive
II (Moderately Toxic)	WARNING	>50-500	>200-2000	>0.2-2	corneal opacity reversible within 7 days; irritation persisting for 7 days	severe irritation at 72 hours
III (Slightly Toxic)	CAUTION	>500-5000	>2000-20.000	>2-20	no corneal opacity; irritation reversible within 7 days	moderate irritation at 72 hours
IV (Practically Non-toxic)	NONE	>5000	>20,000	>20	no irritation	moderate irritation at 72 hours

After *Pesticide User's Guide*, Ohio State University, Extension Bull. No. 745, 1998.

TABLE II: ECOTOXICOLOGICAL RISKS TO WILDLIFE (TERRESTRIAL AND AQUATIC)

Risk Category	Mammals (Acute Oral LD <sub>50</sub> mg/kg)	Avian (Acute Oral LD <sub>50</sub> mg/kg)	Avian LC <sub>50</sub> (mg/kg)	Fish or Aquatic Invertebrates LC <sub>50</sub> (mg/l)
Very Highly Toxic	<10	<10	<50	<0.1
Highly Toxic	10-50	10-50	50-500	0.1 – 1
Moderately Toxic	51-500	51-500	501-1,000	>1 – 10
Slightly Toxic	501-2,000	501-2,000	1,001-5,000	>10 – 100
Practically Non-toxic	>2,000	>2,000	>5,000	>100

Table II created from information contained in *Pesticides and Wildlife*, Whitford, Fred, et al., Purdue University Cooperative Extension Service PPP-30, 1998.

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**This fact sheet was prepared by USDOE-Bonneville Power Administration, March 2000.**