
Dichlobenil

HERBICIDE FACT SHEET

U.S. DEPARTMENT OF ENERGY
BONNEVILLE POWER ADMINISTRATION

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

COMMON NAME: dichlobenil

CHEMICAL NAME: 2,6-dichlorobenzonitrile

Cas No. 1194-65-6

CHEMICAL TYPE: benzonitrile

PESTICIDE CLASSIFICATION: herbicide

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

The contents of the dichlobenil formulation are listed below:

Casoron® Herbicide

Dichlobenil	4.0 %
Inert	96.0 %

RESIDUE ANALYTICAL METHODS: Gas chromatography with electron capture.

II. HERBICIDE USES

REGISTERED FORESTRY, RANGELAND AND RIGHT-OF-WAY USES: Dichlobenil is registered for use in crop and non-crop sites for selective and total weed control. For terrestrial use only.

OPERATIONAL DETAILS:

TARGET PLANTS: Dichlobenil is used for control of annual and perennial grasses, broadleaf weeds, and woody plants.

MODE OF ACTION: Acts on growing points and root tips, dichlobenil inhibits germination of actively dividing meristems.

METHOD OF APPLICATION AND RATES: Ground broadcast, spot and localized applications. One hundred to five hundred pounds per acre depending on target species.

SPECIAL PRECAUTIONS:

TIMING OF APPLICATION: Timing is dependent on the target plant.

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. Spray droplet size should be 150 microns or larger.

Restrictions/Warnings/Limitations: Do not plant or transplant into treated soil. Do not graze livestock in treated areas.

III. ENVIRONMENTAL EFFECTS/FATE

SOIL:

RESIDUAL SOIL ACTIVITY: The half-life of dichlobenil is 60 days.

ADSORPTION: The $K(oc)$ of dichlobenil is 400.

PERSISTENCE AND AGENTS OF DEGRADATION: Dichlobenil is moderately persistent in the plant and soils. The primary route of degradation is microbial activity.

METABOLITES/DEGRADATION PRODUCTS AND POTENTIAL ENVIRONMENTAL EFFECTS: Dichlobenil degrades to 2,6-dichlorobenzamide (BAM) and 2,6-dichlorobenzoic acid. BAM is the primary metabolite produced by soil microbes.

WATER:

SOLUBILITY: 21.2 mg/l in water (pH 7 at 25° C).

POTENTIAL FOR LEACHING INTO SURFACE AND GROUND WATER: Dichlobenil is moderately persistent with a very high soil adsorption coefficient. There is a moderate potential for dichlobenil to leach into groundwater and a high potential for surface water runoff.

AIR:

VOLATILIZATION: 0.088 Pa at 20° C.

POTENTIAL FOR BYPRODUCTS FROM BURNING OF TREATED VEGETATION: Not known.

V. ECOLOGICAL TOXICITY EFFECTS ON NON-TARGET SPECIES

MICROORGANISMS:

ACUTE CONTACT TOXICITY: LD₅₀ (honey bee contact) >120 µg/bee

OVERALL TOXICITY: **Practically Non-Toxic**

PLANTS: Contact will injure or kill target and non-target plants.

AQUATIC VERTEBRATES:

ACUTE TOXICITY: LC₅₀ (rainbow trout 96-hour) 6.26 mg/l

ACUTE TOXICITY: LC₅₀ (bluegill sunfish 96-hour) 6.72 mg/l

OVERALL TOXICITY: **Moderately Toxic**

AQUATIC FRESHWATER INVERTEBRATES:

ACUTE TOXICITY: LC₅₀ (*Daphnia magna* 48-hour) 5.8 mg/l

OVERALL TOXICITY: **Moderately Toxic**

AQUATIC ESTUARINE/MARINE INVERTEBRATES:

ACUTE TOXICITY: LC₅₀ (sheepshead minnow 96-hour) >12.7 mg/l

ACUTE TOXICITY: LC₅₀ (grass shrimp 96-hour) >1.0 mg/l

ACUTE TOXICITY: LC₅₀ (eastern oyster 96-hour) >1.63 mg/l

OVERALL TOXICITY: **Moderately Toxic**

TERRESTRIAL ANIMALS:

AVIAN ACUTE ORAL TOXICITY: LD₅₀ (bobwhite quail) 683 mg/kg

AVIAN ACUTE ORAL TOXICITY: LD₅₀ (mallard duck) >2000 mg/kg

AVIAN SUBACUTE DIETARY TOXICITY: LC₅₀ (bobwhite quail) 5200 mg/kg

AVIAN SUBACUTE DIETARY TOXICITY: LC₅₀ (mallard duck) >5200 mg/kg

MAMMAL ACUTE ORAL TOXICITY: LD₅₀ (rat) 4250 mg/kg

OVERALL TOXICITY: **Slightly Toxic**

BIOACCUMULATION POTENTIAL: **Slight Potential**

THREATENED AND ENDANGERED SPECIES: Federally listed terrestrial and aquatic plants may be adversely affected if the product is applied directly to the plants, or indirectly as the result of drift or leaching.

V. TOXICOLOGICAL DATA

ACUTE TOXICITY:

ACUTE ORAL TOXICITY: LD₅₀ (rat) 4250 mg/kg

ACUTE DERMAL TOXICITY: LD₅₀ (rabbit) >2000 mg/kg

PRIMARY SKIN IRRITATION: Rabbit - Non-Irritant

PRIMARY EYE IRRITATION: Rabbit – Non-Irritant

ACUTE INHALATION: LC₅₀ (rat) >3.3 mg/l

OVERALL TOXICITY: Category III – Slightly Toxic

CHRONIC TOXICITY:

CARCINOGENICITY: EPA Group C - possible human carcinogen.

DEVELOPMENTAL/REPRODUCTIVE: No adverse effects.

MUTAGENICITY: No adverse effects.

HAZARD: The end-use product labels for the dichlobenil formulation Casoron® carries the *Caution* signal word due to potential eye and skin irritation.

VI. HUMAN HEALTH EFFECTS

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: None reported.

HEALTH EFFECTS OF EXPOSURE TO FORMULATED PRODUCTS: None reported.

HEALTH EFFECTS ASSOCIATED WITH CONTAMINANTS: None reported.

HEALTH EFFECTS ASSOCIATED WITH OTHER FORMULATIONS: None reported.

VII. SAFETY PRECAUTIONS

SIGNAL WORD AND DEFINITION:

DICHLORBENIL - **CAUTION** – HARMFUL IF SWALLOWED. AVOID BREATHING DUST. AVOID CONTACT WITH SKIN AND EYES.

PROTECTIVE PRECAUTIONS FOR WORKERS: Applicators and other handlers must wear long-sleeved shirt and long pants, shoes plus socks.

MEDICAL TREATMENT PROCEDURES (ANTIDOTES):

EYES: Flush eyes with water.

SKIN: Wash all exposed areas with soap and water; call physician if irritation persists.

INGESTION: Rinse mouth thoroughly with water. Do not induce vomiting. Call physician.

INHALATION: Remove to fresh air. Call a physician if breathing difficulty persists.

HANDLING, STORAGE AND DISPOSAL: Store at room temperature or cooler. Do not reuse container. Rinse container and dispose accordingly.

EMERGENCY SPILL PROCEDURES AND HAZARDS: Contain and sweep up material of small spills and dispose as waste. Do not contaminate water, food or feed by storage or disposal.

VIII. DEFINITIONS

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

EC₅₀ - 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: $K(oc) = \text{conc. adsorbed}/\text{conc. dissolved}/\% \text{ organic carbon in soil}$

LC₅₀ – the concentration in air, water, or food that will kill approximately 50% of the subjects

LD₅₀ – 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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X. TOXICITY CATEGORY TABLES

TABLE I: HUMAN HAZARDS

Category	Signal Word	Route of Administration			Hazard	
		Acute Oral LD ₅₀ (mg/kg)	Acute Dermal LD ₅₀ (mg/kg)	Acute Inhalation LC ₅₀ (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	Avian	Avian	Fish or Aquatic Invertebrates
	Acute Oral LD ₅₀ (mg/kg)	Acute Oral LD ₅₀ (mg/kg)	Acute Dietary LC ₅₀ (mg/kg)	Acute Concentration LC ₅₀ (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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