

Dicamba

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: dicamba

CHEMICAL NAME: 3,6-dichloro-o-anisic acid

Cas No. 1918-00-9

CHEMICAL TYPE: benzoic acid compound

PESTICIDE CLASSIFICATION: herbicide

REGISTERED USE STATUS: General Use Pesticide. Date and Elevation Restrictions for Aerial Applications in Idaho.

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

The contents of the dicamba formulation are listed below:

Banvel [®] Herbicide		Vanquish [®]	
Dicamba	48.2 %	Dicamba	56.8 %
Inert	51.8 %	Inert	43.2 %

RESIDUE ANALYTICAL METHODS: Gas/liquid chromatography.

II. HERBICIDE USES

REGISTERED FORESTRY, RANGELAND AND RIGHT-OF-WAY USES: Dicamba is registered for use in crop and non-crop sites for selective pre- and post-emergent weed and brush control. For terrestrial use only.

OPERATIONAL DETAILS:

TARGET PLANTS: Selective, pre- and post-emergent herbicide for control of annual and perennial broadleaf weeds and brush.

MODE OF ACTION: Absorbed by root and shoot tissue causing rapid, abnormal cell growth leading to disruption of the phloem system and normal auxin balance.

METHOD OF APPLICATION AND RATES: Aerial and ground broadcast, spot and localized applications. One-half to four pints per acre.

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 exceed 4 pints per/acre/year. Groundwater advisory. Do not apply within 50 feet of wells or other waters. Do not apply in situations favorable to runoff. Do not apply to impervious surfaces. Do not contaminate irrigation ditches or water used for irrigation or domestic purposes. T&E warning for plants.

III. ENVIRONMENTAL EFFECTS/FATE

SOIL:

RESIDUAL SOIL ACTIVITY: The half-life of dicamba is 90 days.

ADSORPTION: The K(oc) of dicamba is 2.

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

METABOLITES/DEGRADATION PRODUCTS AND POTENTIAL ENVIRONMENTAL EFFECTS: Dicamba degrades to carbon dioxide and other unidentified products.

WATER:

SOLUBILITY: 400,000 mg/l in water (pH 7 at 25° C).

POTENTIAL FOR LEACHING INTO SURFACE AND GROUND WATER: Dicamba is moderately persistent with a very low soil adsorption coefficient. There is a high potential for dicamba to leach into groundwater or surface water when applied over shallow aquifers or to soils having high permeability, and to impervious surfaces.

AIR:

VOLATILIZATION: Moderately volatile.

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

IV. ECOLOGICAL TOXICITY EFFECTS ON NON-TARGET SPECIES

MICROORGANISMS:

ACUTE CONTACT TOXICITY: LD₅₀ (honey bee contact) >100 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) >100 mg/l

ACUTE TOXICITY: LC₅₀ (bluegill sunfish 96-hour) >100 mg/l

OVERALL TOXICITY: **Practically Non-Toxic**

AQUATIC FRESHWATER INVERTEBRATES:

ACUTE TOXICITY: LC₅₀ (*Daphnia magna* 48-hour) 38 mg/l

OVERALL TOXICITY: **Slightly Toxic**

AQUATIC ESTUARINE/MARINE INVERTEBRATES:

ACUTE TOXICITY: LC₅₀ (fiddler crab 96-hour) >180 mg/l

ACUTE TOXICITY: LC₅₀ (grass shrimp 96-hour) >100 mg/l

OVERALL TOXICITY: Practically Non-Toxic

TERRESTRIAL ANIMALS:

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

AVIAN SUBACUTE DIETARY TOXICITY: LC₅₀ (bobwhite quail) >10,000 mg/kg

AVIAN SUBACUTE DIETARY TOXICITY: LC₅₀ (mallard duck) >10,000 mg/kg

MAMMAL ACUTE ORAL TOXICITY: LD₅₀ (rat) >500 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) 3512 mg/kg

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

PRIMARY SKIN IRRITATION: Rabbit - Non-Irritant

PRIMARY EYE IRRITATION: Rabbit – Moderate Irritant

ACUTE INHALATION: LC₅₀ (rat) >5.3 mg/l

OVERALL TOXICITY: Category III – Slightly Toxic

CHRONIC TOXICITY:

CARCINOGENICITY: No evidence of carcinogenicity in test animals.

DEVELOPMENTAL/REPRODUCTIVE: Some effects at highest dose levels.

MUTAGENICITY: No effects.

HAZARD: The end-use product labels for the dicamba formulation Vanquish[®] carries the *Caution* signal word due to potential eye and skin hazards.

The end-use product labels for the dicamba formulation Banvel[®] carries the *Warning* signal word due to potential eye hazards.

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: EPA reports no toxicological endpoints of concern..

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:

DICAMBA (*Vanquish*[®]) - **CAUTION** – AVOID CONTACT WITH SKIN, EYES OR CLOTHING. HARMFUL IF SWALLOWED.

DICAMBA (*Banvel*[®]) - **WARNING** – CAUSES EYE IRRITATION. DO NOT GET IN EYES, ON SKIN OR ON CLOTHING. HARMFUL IF SWALLOWED.

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

BASF Corporation, Banvel® Herbicide, Specimen Product Label, NVA 97-4-63-0099, 1997

BASF Corporation, Banvel® Herbicide, Material Safety Data Sheet, Product No.: E07141, October 1, 1999

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

Extension Toxicology Network, Pesticide Information Profile, Dicamba,
<http://ace.orst.edu/info/extoxnet/pips/ghindex.html>

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<http://ace.orst.edu/info/extoxnet/tibs/bioaccum.htm>

Novartis Crop Protection, Inc., Vanquish® Herbicide, Specimen Product Label, NCP 884A-L1B 0798, 1998

Novartis Crop Protection, Inc., Vanquish® Herbicide, Material Safety Data Sheet, A-10182 A, February 9, 1999

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

USDA Forest Service, Pesticide Fact Sheet, Dicamba, November 1995 <http://www.infoventures.com/e-hlth/pesticide/pest-fac.html>

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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