



Krovar[®] I DF

PRODUCT INFORMATION BULLETIN

KROVAR I DF is a biodegradable product used for selective weed control in non-crop sites. It contains two active ingredients, bromacil and diuron and is formulated as a water-dispersible granule to be mixed in water and applied as a spray suspension.

Biology

Biological Activity

After application of KROVAR I DF, moisture is necessary to move the active ingredients into the soil. Once in the soil, bromacil and diuron are available for uptake by germinating weed seeds and plant roots; the products are absorbed to a lesser degree by the leaves of plants. KROVAR I DF is most readily absorbed through the root system. Translocation is primarily upward through the xylem, accumulating in the leaf.

Once in the leaf, KROVAR I DF inhibits photosynthesis, the process by which plants manufacture food. The symptoms on a susceptible plant after treatment will be interveinal and veinal chlorosis (yellowing) in older leaves. Broadleaf plants will also exhibit a brown colouration (necrosis), and grass plants will exhibit a white colouration. KROVAR I DF affects a susceptible plant's ability to manufacture food, so the plant dies.

KROVAR I DF is a residual-type product, remaining in the soil for a period of 1 to 2 years and providing control of emerging weeds until the product is decomposed by natural biological processes.

Physical & Chemical Properties

Solubility

KROVAR I DF is suspendible in water. The aqueous solubility of the two active ingredients at room temperature (25°C or 77°F) is very low (42 mg/litre) for diuron and low (815 mg/litre) for bromacil.

Compatibility

KROVAR I DF is compatible with most other non-crop herbicides. Before making a tank mixture with KROVAR I DF, refer to the spray preparation section on the label.

Stability

KROVAR I DF in the dry form remains stable in its original unopened container at normal temperatures and storage conditions.

Volatility

KROVAR I DF is nonvolatile. It does not evaporate readily at normal atmospheric pressures and temperatures.

Environmental Fate

Soil Dissipation and Biodegradability

KROVAR is a complex of bromacil and diuron. It breaks down into these components as soon as it comes in contact with soil.

Diuron breaks down slowly in soil as the result of microbial action. It breaks down to a lesser extent in aquatic sediments. It does not readily degrade in natural waters (pH 5-9), unless exposed to sunlight.

Bromacil breaks down slowly in soil and rapidly in anaerobic aquatic sediments as a result of microbial activity. It degrades rapidly in basic water (pH 8-10) when exposed to sunlight. It is stable in water when sunlight is not present.

KROVAR I DF is biodegradable and does not accumulate in the environment. The primary means of degradation is metabolism by soil microbes.

Hydrolysis Half-Life

The hydrolysis half-life of diuron in a naturally occurring aquatic environment is about 45 days. Scientific studies show its half-life in sterile water is greater than 500 days (at pH of 5,7 and 9, at 25°C in the dark).

The hydrolysis half-life of bromacil in naturally occurring aquatic environments is 4-11 days, due to the presence of microbes, sunlight, and sediment. Hydrolysis half-life in sterile water is greater than 30 days (at pH of 5,7 and 9, at 25°C in the dark).

Metabolism and Bioaccumulation

KROVAR breaks down into its two components, bromacil and diuron, as soon as it comes into contact with soil, water or other media. Diuron and bromacil are broken down by oxidation into lower molecular weight materials. As shown in the charts below, diuron and bromacil are relatively low in toxicity to humans, animals, and the environment when used according to label directions. Neither diuron nor bromacil show any significant bioaccumulation in animals or fish.

Water Quality

KROVAR I DF contains 40% bromacil, which can travel (seep or leach) through the soil. The correct use rates, proper mixing-loading site precautions, and procedures must be followed to minimize potential bromacil movement into water. When used according to the label, KROVAR I DF does not adversely affect water supplies. Diuron binds strongly to soil particles, so it does not have significant potential to move into groundwater.

Wetlands

Direct application of KROVAR I DF to water or wetlands is not permitted.

Toxicology (Mammalian)

Study	Results	Comments
Acute Oral (Rat)	LD50 ¹ 2,300 mg/kg	Compared to other commonly used compounds KROVAR I DF is considered to be slightly toxic by ingestion.
Acute Dermal (Rabbit)	LD50 ¹ > 2,000 mg/kg	Dermal application of concentrated KROVAR I DF was not lethal at the highest practical dose tested.
Acute Inhalation (Rat)	4-hour LC50 ¹ > 5 mg/Litre ²	Based on separate 4-hour tests for each active ingredient, the inhalation toxicity of concentrated KROVAR I DF was estimated to be very low.

Toxicology (Mammalian) continued

Study	Results	Comments
Skin Irritation	Slight irritation	Slight but reversible irritation resulted after 4 hours direct skin contact with concentrated product.
Skin Sensitization	Nonsensitizer	KROVAR I DF did not produce an allergic/sensitization response.
Eye Irritation	Moderate irritation	Eyes were normal within 7 days of treatment with the concentrated KROVAR I DE

Toxicology (Avian and Aquatic)²

Study	Results	
	Bromacil	Diuron
Acute Oral (LD50 ¹) Mallard Duck	-	> 2,000 mg/kg
Acute Oral (LD50 ¹) Bobwhite Quail	> 2,250 mg/kg	-
8-day Dietary (LC50 ¹) Mallard Duck	> 10,000 ppm	> 5,000 ppm
8-day Dietary (LC50 ¹) Bobwhite Quail	> 10,000 ppm	1,730 ppm
Bluegill Sunfish (96-hour LC50 ¹)	127 ppm	25 ppm
Rainbow Trout (96-hour LC50 ¹)	36 ppm	20 ppm
<i>Daphnia Magna</i> (48-hour LC50 ¹) (Water Flea)	119 ppm	8 ppm

¹ LD50 and LC50 - dose or concentration that is lethal to 50% of the test population. Doses are commonly defined in milligrams per kilogram of body weight (mg/kg). The smaller the numerical value of LD50 and LC50, the greater the acute toxicity of the substance.

² Studies were conducted with the active ingredient.

Effects of Repeated Exposure

KROVAR I DF contains the active ingredients bromacil and diuron. Each has been evaluated in a number of studies to determine the potential effects of multiple exposures. These studies have been conducted in several species and have included short-term and chronic exposures. Daily and excessive dietary exposures to the active ingredients have produced reduced body weights, increased liver weights, and slight to minimal microscopic changes in the spleens, thyroids, bladders, and/or livers of one or more of the test species. Lifetime exposures resulted in tumors in the livers of mice or the bladders of rats at excessive dietary doses of bromacil and diuron, respectively. Tumor responses were not observed in other species similarly exposed to excessive doses. In addition, an equivocal tumor response was reported for mice at excessive diuron exposures.

Moderate to low exposures of laboratory species to bromacil or diuron did not result in tumors and produced only minimal to no effects. The laboratory data reflected exposures that were much greater than those likely encountered by workers, consumers, or wildlife. Therefore, when used in accordance with labeled directions, the margins-of-safety for KROVAR I DF are considered protective of the health of those exposed to this product.

The active ingredients in KROVAR I DF also have been extensively evaluated for their potential to produce mutations and genetic damage, effects on fertility, and the potential to produce malformations in the fetus. Each of these tests or battery of tests produced a negative response.

Inerts

The inert ingredients contained in this product formulation are not classified by authorities as inert ingredients of toxicological concern to humans or the environment.

The inert ingredients in this product formulation are required by law to have been approved by Federal regulatory authorities.

Worker Safety

KROVAR I DF should not be applied in such a manner as to directly or through drift expose workers or other persons. Workers performing hand labour operations should not enter treated areas without protective clothing until sprays have dried.

Other Information

Off-Site Movement

Prevent drift of dry powder or spray to desirable plants, as injury to or loss of plants may result. Do not apply KROVAR I DF in locations where it may be washed or moved into contact with desirable vegetation. Carefully follow all label instructions and precautions.

References

For further information about Du Pont products, contact your local Du Pont representative, or call 1-800-667-3925 in Western Canada or 1-800-387-2169 in Eastern Canada.

For medical emergencies involving this product, contact the Du Pont Haskell Laboratory for Toxicology and Industrial Medicine, 1-800-441-3637.

For transportation emergencies, contact (613) 348-3616.

For more information on pesticides, feel free to contact any of the following:

Agriculture Canada Regional Office
Crop Protection Institute - (416) 622-9771



For more information on this product,
please contact your Territory Manager:
Western Canada Eastern Canada
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