



DRC 1339 - Starlicide®

**The National House Crow Eradication Programme
2020-2025**



Facts You Need to Know



DANGEROUS POISON. ECOTOXIC.

KEEP OUT OF REACH OF CHILDREN.

HSNO Codes: 6.1C, 6.5B, 6.8B, 8.2C, 8.3A, 9.1A, 9.2D, 9.3A

DRC 1339

Powder for incorporation into preparations for rook and starling control.
Contains 970 g/kg of 3-chloro-p-toluidine hydrochloride

Warning: Acutely toxic. May be fatal or harmful if swallowed, inhaled or absorbed through the skin. Repeated oral exposure may cause reproductive or developmental damage. Corrosive to the skin and eyes. Avoid skin contact or inhalation. When handling open containers or preparing and laying baits, wear protective equipment as shown in pre-cautions section below. Toxic to aquatic organisms and terrestrial vertebrates. Take measures to prevent access to baits by non-target birds and animals. Do not place baits in areas where they may enter waterways. Avoid pollution of any water supply with baits or used containers.

Storage: Store in original container, tightly closed, under lock and key, in a cool and completely dark location away from feed or foodstuffs. Keep out of reach of children. This product must always be under the control of an Approved Handler who holds a current test certificate endorsed for Class 6, 8 and substances.

Precautions: When preparing, handling or laying baits, wear overalls and impervious rubber or PVC gloves. When handling the powder and open containers wear goggles and a dust mask as protection against dust entering the eyes or mouth. Do not eat, drink or smoke when using the product or handling open containers. Wash protective clothing and equipment daily after work. Remove protective clothing and wash hands and exposed skin thoroughly before meals and after any contact. Thoroughly wash implements and bait laying equipment before removing them from the operational area.

Symptoms of Poisoning: Symptoms may include burning of the throat, skin or eyes; nausea, possible vomiting and stomach pains.

EMERGENCY MANAGEMENT:

First Aid: Act immediately if poisoning is suspected. DO NOT induce vomiting. If the eyes are affected, rinse the eyes with fresh running water for 10 minutes. Wash affected areas of skin with warm, soapy water. If swallowed, call a doctor or emergency physician at your nearest hospital immediately. For further advice contact National Poisons Centre 0800 POISONS (Phone 0800 764 766).

Spillage: In the event of a spill, isolate the spill area and exclude all bystanders. Take all practicable steps to manage any harmful effects of a spillage including preventing the powder or baits from entering streams or waterways. Scoop spilled material into secure containers. Recover any undamaged material for later use by placing in appropriately labelled containers and dispose of spoiled material as directed below. Use a broom to collect fine material and wash down the spill area with copious water only after all spilled material has been removed.

Disposal: DRC 1339 degrades rapidly when exposed to heat, sunlight and ultraviolet radiation. The half-life of DRC 1339 in biologically active soil is 24-48 hours and the identified metabolites have low toxicity. Product which is surplus or spoiled, including baits, should be disposed of by burying on the active tip face of an approved landfill. Alternatively, dispose of surplus material through a sewage oxidation facility or other chemical treatment facility. Bury container in a suitable at a landfill. Do not use the empty container for any other purpose.

DIRECTIONS FOR USE

(1) Ground baiting: it is essential to pre-feed birds with non-toxic baits which are prepared and laid in the same fashion as the toxic baits (without adding the DRC 1339).

Preparation of bread baits: Cut a loaf of slightly stale toast sliced white bread into 2 cm squares and thoroughly mix 2.5g of DRC 1339 with 1 litre of melted dripping. Quickly soak the squares of bread in the warm dripping/DRC 1339 mixture, drain and then shake the squares into a large flat container of flour. Baits should be quickly rolled to coat them in flour and then placed on a rack to cool.

Preparation of macaroni or walnut baits: Cook macaroni until firm (not soft), or use crushed walnut pieces. Thoroughly mix 2.5g of DRC 1339 to every kg of bait using a small quantity of cooking oil as a sticking agent. Use a tea strainer or pepper shaker dedicated to this purpose, to achieve an even distribution of DRC 1339 over the bait.

Bait storage, use and removal: Store baits overnight in a suitable locked chest freezer and use within a day or two. Lay baits on the edge of crops where rooks or starlings are visiting or at suitable sites near roosts and rookeries. Avoid laying baits where non-target birds and animals may take baits. Gather up any uneaten baits at the end of the day to further reduce possible non-target impacts, taking special care to remove baits where short tailed bats are known to be present.

(2) Nest Baiting: Melt petrolatum gel. Stirring continuously, allow to cool until it becomes cloudy indicating imminent change from liquid to gel state. Continue stirring and mix DRC 1339 powder in at a ratio of 5% w/v (e.g. 25 grams per 500ml). Transfer the mix into 500ml mastic gun tubes, apply the stopper, and roll in a drum of cold water to cool. Cooling the mixture quickly is important as the powder has a tendency to settle out of suspension when the petrolatum is in a liquid state. Store the gel overnight in a suitable locked chest freezer and use within a day or two. Using a mastic gun, apply beads of the gel to the inside of rook nests while the chicks are in the nest but prior to fledging. One tube will treat 5-10 nests depending on nest size and construction.

Legal obligations: Signs must be erected at every normal point of entry to the place where the substance is to be applied and must remain for no less than 2 months after the last baits are laid and until baits are eaten, destroyed or otherwise removed. This product must only be used as specified in the label and may be used only under the direct control of a person holding a valid Controlled Substances Licence specifically authorised for DRC 1339.

Shelf life: The shelf life of this product may vary according to the suitability of storage conditions. Always store DRC 1339 powder in total darkness to prevent rapid toxicity loss. Any DRC 1339 powder held after the expiry date shown on the bag should be disposed of according to label directions.

Livestock: It is extremely important to prevent access to baits by domestic livestock and pets. Stock must be kept off the treatment area until baits have been washed out by rain, removed or destroyed. Dogs and cats are at risk from eating poisoned baits and pet owners in the immediate vicinity should be notified of this risk. Where practical, collect any dead birds found and dispose of these by burning or by burying at a depth of at least 60 cm.

Transport information: UN 1708, Packing Group III, Toxic 6.1C, Hazchem: 3X EPA Approval Code: HRC000023

Conditions of sale: As no control can be exercised over the methods or conditions under which this product is used, no responsibility or claim, other than those required by statute, will be accepted for any damage or injury whatsoever arising from the storage, handling, application, use or disposal of this product.

Registered to and distributed by Animal Control Products Ltd
408 Heads Road, Whanganui, New Zealand PH 64 6 344 5302

For safety data sheet go to <http://www.pestoff.co.nz>

Registered pursuant to the ACVM Act 1997, No. V002624

See: <http://www.foodsafety.govt.nz> for registration conditions.

NET WEIGHT

_____(number)

X (of)

_____(weight)

PACKS



BATCH No:

SO/Pack No:

EXPIRY DATE:

WJS:HBA PRINT AUG 2013

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1. Introduction to DRC-1339 (3-chloro-4-methylaniline hydrochloride)

DRC-1339 (3-chloro-4-methylaniline hydrochloride) is the only toxicant currently registered by the U.S. Environmental Protection Agency (USEPA) for lethal bird control for the purposes of protecting human health and safety, agricultural crops and threatened or endangered species.

DRC-1339 was first registered in 1967 for starling control at feedlots. It is currently used to manage:

- Blackbirds
- Rock doves
- Crows
- Ravens
- Magpies
- Gulls
- Starlings



DRC-1339 was discovered during the screening of over 400 chemicals at the Denver Wildlife Research Centre for a material that was highly toxic to a limited number of bird species, of low toxicity to humans and other animals, palatable to the bird pests (in that case, starlings), and with a slow, non-violent mode of action to prevent other birds from being alarmed and avoiding the baits. DRC-1339 met all these requirements.

- For more than 50 years, DRC-1339 has proven to be an effective tool for starling, pigeon, blackbird, corvid, and gull damage management (West et al. 1967, West and Besser 1976, Besser et al. 1967, and DeCino et al. 1966).
- DRC-1339 is a slow acting avicide that kills target birds between 3 and 80 hours after ingestion of a lethal dose (Dawes 2006). The slow action of the avicide allows the chemical to be partially or mostly metabolized prior to the birds succumbing to the chemical (Schafer 1984, Goldade 2017).
- DRC-1339 appears to pose little risk of secondary poisoning to nontarget animals, including avian scavengers (Cunningham et al. 1979, Schafer 1984, Knittle et al. 1990). The technical grade 5 of the active ingredient is very highly acutely toxic to many pest birds, but generally less acutely toxic to raptors, waterfowl, finches, and other birds, and most mammals (DeCino et al. 1966, Palmore 1978, Schafer 1981). For example, an 89 g starling, a highly sensitive species, requires a dose of only 0.3 mg/bird to cause death (Royall et al. 1967) while many other bird species such as raptors, house sparrows, and finches are classified as non-sensitive, requiring a much higher dose (Eisemann et al. 2003). A 29 g house sparrow would require a dose of 9 mg, while a 22 g house finch and a 118 g American kestrel would require more than 5 mg and 38 mg (DeCino et al. 1966, Schafer et al. 1983). It should be noted that larger birds and pigeons require more product (more toxicant) to be taken lethally.
- Secondary hazards of DRC-1339 are extremely low unless toxic bait is still largely intact in the carcass.
- DRC-1339 acts in a relatively humane manner producing a quiet death (Timm 1994, Dawes 2006).

2. How does DRC-1339 Work?

Acute dietary toxicity testing has been conducted on six species of birds. Additionally, dietary testing has been conducted on twelve species by offering treated bait used in actual bird control projects. Four species have been tested for reproductive toxicity.

DRC-1339 appears to have different modes of action in more susceptible and less susceptible species. The biochemical mechanism behind its toxicity is not definitively understood for any animal, but there is considerable support for the view that renal deacetylase has an important role in the sensitivity of species to this compound. Relatively insensitive mammals and raptors do not have mitochondrial renal deacetylase, whereas extremely sensitive birds do. In more susceptible species DRC-1339 causes renal failure. Uric acid deposits build up in the cardiovascular system causing necrosis and circulatory impairment, and leading to nephrotoxicity, uremic poisoning, and congestion of major organs. A quiet death follows 3-80 hours after ingestion, depending on the dose consumed.

A study of the gross and microscopic pathology of DRC-1339 toxicity after a single oral dose in rooks and pheasants showed extensive parenchymal degeneration of the kidney, fatty degeneration of the liver and congestion of the major organs in birds that died within 18 hours of ingestion of the toxicant. In birds that died later there were deposits of uric acid crystals on the serosal surfaces of various organs. This resembles avian visceral gout, which is a non-specific condition following renal failure in birds.

Methemoglobinemia is not believed to be a primary contributor to death, except possibly in cats. In less susceptible species, which should not receive a toxic dose of DRC-1339 if appropriately administered, there appears to be a different mechanism of response to high doses of DRC-1339, with depression of the central nervous system resulting in cardiac or respiratory arrest. In mammals and raptors this has been successfully treated symptomatically, but it should be noted that incidence of this form of toxicity in species that are only moderately or slightly sensitive to DRC-1339 should be minimised by appropriate application of baits. DRC-1339 does not appear to affect avian reproduction except at levels close to those at which toxicity occurs.

3. Toxicity to Various Birds Including Non-Target Species

A large body of toxicity information is available because of the nature of DRC-1339 uses and its thirty five-year history of use. Laboratory testing has resulted in estimates of median Lethal Dose (LD) for fifty five species of birds, including six African birds.

DRC-1339 is highly toxic to target species. Acute oral toxicity estimates for colymbids, corvids, icterids, the herring gull (*Larus argentatus*) and starling are generally lower than 6 mg/kg. Within the Corvidae, three species of jays, which are not target species, have also been tested. Like all other tested members of this family, all three jays are extremely sensitive to DRC-1339, with Lethal Dose (LD) below 6 mg/kg.

Only one columbid, the rock dove, is considered a target species. However, the four additional dove species that have been tested all have estimated LDs of 6 mg/kg or less, which is 2 to 3 times more sensitive than the rock dove.

Study 1: *USDA National Wildlife Research Center; Staff Publications; ACUTE AND CHRONIC TOXICITY OF COMPOUND DRC-1339 (3-CHLORO-4-METHYLANILINE HYDROCHLORIDE) TO BIRDS; University of Nebraska - Lincoln Year 2003*

Five species of African passerines (Ploceidae) were among the fifty-five species tested in hopes of developing DRC-1339 to control them. Tests showed that except for the red-billed quelea (*Quelea quelea*), these small granivores were relatively tolerant with LDs over 200 mg/kg. Even the quelea, with an LD of 31.6 mg/kg, was not sensitive enough to continue development of the avicide (Shefte et al. 1982).

The USEPA classification used the following labels, based upon the inherent toxicity of the active ingredient, for toxicity to birds. According to the USEPA's terminology, DRC-1339 is moderately toxic to even the least sensitive species.

Description	LD50*
'very highly toxic'	<10 mg/kg
'highly toxic'	10 to 50 mg/kg
'moderately toxic'	51 to 500 mg/kg
'slightly toxic'	501 to 2000 mg/kg
'practically nontoxic'	(>2000 mg/kg

** LD50 represents the dose of DRC-1339 required to kill half the animals in a treated sample and is expressed as milligrams of DRC-1339 per kilogram of body weight (mg/kg).*

Species	DRC-1339 Estimated Lethal Dose LD (mg/kg)
House Crow	2.5-5mg/kg (manufacturers recommendations)
American crow	1.3mg/kg
European starling	3.2mg/kg
Mourning Dove	3.2mg/kg
Chicken	3.0-7.4mg/kg
Barn Owl	4.2mg/kg
African Bulbul	6.7mg/kg
Rock Dove	10-20mg/kg
Red Billed Quelea	31.5mg/kg
Golden Eagle: like Tawny Eagle	>100mg/kg
Red Tailed hawk (like Augur buzzard)	<320mg/kg
House sparrow	375mg/kg
American kestrel (like small falcon)	>320mg/kg
Cooper's Hawk (like African Goshawk)	562mg/kg



NOTE: Highlighted birds indicate LD <10mg/kg

Toxicity of DRC-1339

Species	LD50* (mg/kg)
Crow	2
Starling	3.8
Blackbird (American)	3
Rook (New Zealand)	3
Chicken	6
Turkey	6
Dove	6-10
Magpie (American)	6-18
Pheasant	10
Blue Jay	10
Duck	10-30
Teal Duck	10-100
Marsh Hawk	100
Sparrowhawk	320
Sparrow	320-450
Sheep	400
Mouse	1000-2000
Rat	1200-1800



NOTE: Highlighted birds indicate LD50 <10mg/kg

* LD50 represents the dose of DRC 1339 required to kill half the animals in a treated sample and is expressed as milligrams of DRC 1339 per kilogram of body weight (mg/kg).

NOTE: Poultry are susceptible to DRC-1339, and care must be taken to prevent them from feeding on poisoned bait. Under normal conditions, DRC-1339 is not dangerous to sheep, dogs, cows, or other mammals.

In target species, death occurs 1–3 days post-ingestion by irreversible kidney and heart damage (from methemoglobinemia) and CNS depression (cardiac and respiratory arrest).

- Risk to raptors has been considered low because of its milder mode of action (primarily CNS depression), **with the exception of owls**.
- Raptors (e.g., Cooper's hawk and American kestrel) fed a diet of birds killed with DRC-1339 for over 100 days were not found to suffer any ill effects and all gained weight (DeCino et al. 1966).
- DRC-1339 is rapidly (90% in 2 hours) metabolized and excreted in all species.

4. Symptoms of Poisoned Birds

DRC-1339 is absorbed into the bloodstream and impairs the liver and kidney functions. Death apparently results from uremic poisoning. The damaged kidneys are unable to excrete the body's waste products, and these build up in the bloodstream to a lethal level. The first symptoms of poisoning are an increase in water consumption, followed by a sharp drop in the intake. About four hours before death, the birds cease to eat or drink and become listless and inactive. They perch with feathers ruffled, as in cold weather, and appear to doze. As death nears, breathing increases slightly in rate and becomes more difficult. The birds finally become comatose and die. There are no convulsions or spasms; consequently, there are no distress calls or 'spooking' to deter other birds from feeding. Poisoned birds are characterised by fluffed-out feathers and by tucking their feet inside the lower breast feathers.

5. What Happens to DRC-1339 in the Bird's System Over Time?

Although People's and Apostolou's results indicated that DRC-1339 was rapidly excreted and metabolized, a study by Westberg in 1969 showed that DRC-1339, DRC-2698, CPT-C, CPT-D residues were concentrated in the liver and kidneys but not brain or muscle following a 15 mg/kg dose of DRC-1339 in chickens. Peak tissue concentrations occurred approximately 30 minutes after treatment. Giri, Gribble, and Peoples (1976) reported that radio-labeled DRC-1339 administered to starlings intravenously (14.7 μ Ci) was found to be unevenly distributed throughout the body. The half-life of radioactivity ranged from 3-6 hours in brain, spleen, heart, and bone marrow to 8-14.6 hours in muscle, lung, liver, and kidney.

In one study, less than 10% of a 100 mg/kg dose of DRC-1339 in starlings remained in the form of DRC-1339 or DRC-2698 30 minutes after treatment, indicating that more than 90% of the DRC-1339 administered had either been excreted or metabolized. Results with lower dosage levels indicated that, although the administered dose of DRC-1339 was initially metabolized or excreted very rapidly, from 1-5 ppm of DRC-1339 or DRC-2698 remained in body tissue throughout the entire 1-hour test period, regardless of the dosage administered. Thus, when starlings ingest amounts of DRC-1339 that are close to the LD50 (3.76 mg/kg), less than 50% of the compound is excreted or metabolized during the first hour. This indicates limited, but rapid, binding to tissue, body protein, fat, or other body constituents.

When starlings were dosed with DRC-1339-treated pellets and their carcasses analyzed after they expired from DRC-1339 intoxication, the results were similar to the previous study. Starlings dosed with 3.16 to 100 mg/kg DRC-1339 all retained approximately 1 to 2 ppm of DRC-1339 and DRC-2698 residues at death. There was no obvious effect of dosage levels nor time to death on residue levels, indicating that small amounts of DRC-1339 and DRC-2698 are bound to some body component. Tests are underway to increase sample sizes for the stomach tube and pellet tests and to include fecal analyses; however, the results probably will not change from what have been reported, although variation between dosage levels should be reduced.

6. Owls and Cats

These data indicate that predator or scavenger birds or mammals subsisting wholly on DRC-1339-killed starlings are being exposed to a continuous 1-2 ppm level of DRC-1339 in their diet. For most predator or scavenger species, these residue levels do not pose any hazard since DRC-1339 has a low acute toxicity and negligible chronic toxicity to these species. Some species, however, may be at risk, particularly owls and cats, since these species are all extremely sensitive to DRC-1339 intoxication.

Although the possibilities of acute intoxication are negligible, since each animal would have to consume 2-3 times its own body weight at one feeding to ingest an acutely toxic dose, the possibility of chronic intoxication exists. (Schafer, et al. 1977) have shown that DRC-1339 is a chronic toxicant in sensitive bird species, and there is no reason to believe that cats or owls, will be any different in this respect than the species they tested. Starlings ingesting 5.0 ppm DRC-1339 in their diet survived for an average of 27 days; 50 days at 2.5 ppm, and 77 days at 1.0 ppm; and there was no indication that the lower limits of chronic intoxication had been reached. Thus, DRC-1339-killed crows may present a potential secondary hazard to cats and owls, if their diet consists primarily of DRC-1339-killed crows for more than 30 days.

7. Is the Use of DRC-1339 Humane?

Some people have stated that DRC-1339 is an inhumane toxicant and should not be used. Any use of lethal methods, toxicants, is considered by many individuals to be inhumane even if time until death and symptoms exhibited appear to be minimal. DRC-1339 causes renal failure in treated birds (Timm 1994).

Renal failure in birds causes weight loss, depression, lethargy, increased thirst (polydipsia) and urination (polyuria), dehydration, articular gout, and eventually death (Merck 2018). Death in birds occurs typically within a few hours following ingestion of a lethal dose (Timm 1994). Mammals can succumb rather quickly with those ingesting a lethal dose dying in 3 to 12 hours (Timm 1994). Research is not available on pain experienced by birds treated with DRC-1339, just observational reports (DeCino et al. 1966, Timm 1994, Dawes 2006); convulsions, spasms or distress calls have not been observed in birds receiving a lethal dose, rather the birds die a seemingly quiet death. Birds that get a lethal dose may show no outward clinical signs for many hours and go about normal activities. About four hours before death, the birds cease to eat or drink and become listless and inactive, and possibly comatose (Timm 1994, Dawes 2006). They perch with their feathers puffed up (piloerection) and appear to doze.

8. How Long Does It Take for Birds to Die?

The time to death after ingestion of DRC-1339 depends on the sensitivity of the species and the dose consumed. Birds respond to DRC-1339 as most living organisms respond to toxic compounds, in that the higher the dose the more rapid the death. Most deaths occur 3-20 hours after ingestion, but they are recorded for up to 80 hours if the dosage was low. Baiting design is optimised to deliver a lethal dose to the target species with minimal consumption of the bait, and thereby to hasten death as much as possible.

9. If Birds Eat a Sub-lethal Dose, does this Result in Chronic Damage?

Birds that survive ingestion of DRC-1339 do not appear to suffer from chronic toxicity. Studies have been conducted in which oral doses of 0, 1.0, 2.0 and 3.0 mg/kg DRC-1339 were administered to 20 starlings, 5 at each dose. Four birds died within 50 hours of ingestion, one from a 2.0 mg/kg dose and three from the 3.0 mg/kg dose. No further mortality occurred during the remaining 26 days of the study. In a separate study no changes were found in the gross and microscopic pathology of rooks and pheasants that survived a single oral dose of 0.7-1.0 and 7.0-10.0 mg/kg, respectively.

10. What Steps are Taken to Minimize the Risk of Poisoning Non-target Species?

Prior to the application of DRC-1339, during pre-baiting, monitoring occurs for non-target species that may consume the bait. If non-target species are observed, then the use of DRC-1339 would be postponed or not applied at that location, or the non-target species chased off. Pre-baiting House Crow numbers are closely monitored to assess palatability of the bait and to prevent over baiting. The low risk of secondary hazards reduces the potential exposure to sensitive threatened and endangered species as well as preclude hazards to most other non-target species.

11. Risks to Exposure of Carcasses

Issues have been raised concerning the risk from House Crows killed with DRC-1339, exposure of carcasses to people and pets, and the impact of their carcasses on the environment. Birds die in their night-time roost. One issue is that birds could die near people's residences or in the middle of town, which could be a bother to the property owner and pets, or the public the next morning. To manage these risks a thorough understanding of the feeding and roosting sites is necessary to pick up dead birds from a roost that are associated with a baiting site.

Mammals and birds metabolize or excrete DRC-1339 within a matter of hours, and known metabolites are non-toxic to birds and mammals (Peoples 1965, Cunningham et al. 1979, Timm 1994). Species sensitive to DRC-1339 may be able to get a toxic dose of DRC-1339 from undigested gut contents (Knittle et al. 1990), hence the importance of pick-up at roost sites early in the morning.

12. Human Health

Exposure by the public to DRC-1339 is unlikely when applicators follow label requirements concerning application sites, entry restrictions, pre-baiting, and post-treatment cleanup requirements. Entry restrictions only allow protected applicators in the area during application. Persons other than authorized handlers must always stay away from the treated area, and pets and livestock kept away from the treated area.

USDAAPHIS evaluated the potential human health and ecological risks from the proposed use of DRC- 1339 to control bird damage. DRC-1339 is corrosive to eyes and skin and the acute inhalation toxicity is unknown but assumed to be Category I (most hazardous) by

EPA. Although the hazard potential could be high, the anticipated minimal exposure to this pesticide will be low risk due to the limited use of the product. Exposure is greatest for workers who mix the product with a bait material. Use of Personnel Protective Equipment (PPE) results in a low potential for exposure and risk to handlers. The potential exposure and risk to the public is low due to the use pattern, lack of contact and lack of dietary exposure through food or drinking water.

13. First Aid Treatment in the Field

If the concentrate or treated baits are swallowed, make the patient drink a glass or two of water and induce vomiting by putting your finger down his/her throat. Repeat until the vomit fluid looks clear. Call a doctor immediately.

14. Danger to Other Animals

Although DRC-1339 is relatively non-toxic to most mammals and many bird species, poultry and gamebirds are susceptible to the poison and should be kept out of treated areas. Cats and owls are also at high risk.

15. Environmental & Ecological Contamination

DRC-1339 is an organochlorine but does not appear to have the persistence or the tendency to accumulate in the food chain that other organochlorines such as DDT have.

However, DRC-1339 is soluble in water and is moderately toxic to fish. Take care to avoid contaminating streams, lakes, ponds, or other water supplies. Some plant species are also affected by DRC-1339.

The environmental fate and toxicology of DRC-1339 have been thoroughly reviewed. Reported half-lives of DRC-1339 range from 1-3 days and are highly dependent upon climatic conditions. The half-life in soil under aerobic conditions is approximately 25 hours. The aquatic photolysis half-life is between 6.5 and 41 hours. DRC- 1339 is highly soluble in water but does not hydrolyze. High affinity to soil organic matter explains the low soil mobility of DRC-1339.

Ecological risks to aquatic nontarget organisms are low based on the use pattern, available toxicity data and labeled mitigation measures designed to reduce exposure to aquatic habitats. Risks to terrestrial invertebrates and plants are also low based on available effects data and the method of application. Risk is greatest for sensitive terrestrial non-target vertebrates, particularly birds, but these risks can be reduced by applying measures that are designed to reduce exposure.

DRC-1339 is unstable and does not persist in soil. It degrades rapidly in soil when exposed to sunlight, heat, or ultraviolet radiation (USDA 2001). DRC-1339:

- has an average degradation half-life in soil of 0.17 days based on results from four different soil types (Battelle 2018). Dissipation half-life values ranged from 0.02 days in a Texas loam to 2.0 days in a clay soil.
- has low mobility in high organic matter soils because it strongly binds to organic matter.
- binds rapidly and irreversibly to soil organic matter suggesting that volatilization from soil into the atmosphere is not a significant pathway for exposure.
- has moderate vapor pressure (1.06×10^{-4} torr at 250C) and a high Henry's Law constant value (estimated - 1.47×10^{-8} atm-m³-mol⁻¹), suggesting a low potential for volatilization into the atmosphere from aqueous solutions (USEPA 2018a).
- has low migration potential to groundwater and surface water due to its high affinity to soil organic matter.

DRC-1339 is highly soluble in water. DRC-1339:

- is resistant to hydrolysis but sensitive to light with a photodegradation half-life in water ranging from 6.5 to 41 hours depending on the season, as it is faster in summer than winter (USDA 2001, USEPA 2011a).
- is not expected to bioconcentrate in aquatic environments.
- slightly accumulates in bluegill fish with average bioconcentration factors of 33x (edible tissues), 150x (nonedible tissues), and 88x (whole fish) (Spanggord et al. 1996, USEPA 2018a).

Uptake by plants is unlikely since DRC-1339 is mixed with a bait that is used on bare soil, fallow ground, or in trays. Any DRC-1339 that would leach from the bait material would degrade quickly in soil or bind to soil organic matter reducing bioavailability to plants. In addition, most of the bait is removed by the target species reducing the amount of DRC-1339 available for any potential plant uptake. Any bait remaining is removed from the site.



16. Summary

1. DRC-1339 is a selective toxicant that is very highly toxic to some families of birds including owls, and to cats, but only moderately or slightly toxic to other birds and mammals as well as to fish and invertebrates.
2. After ingestion of DRC-1339, birds may be thirsty and seek water but do not display other signs of distress. They die a quiet, non-convulsive, sometimes comatose death, without flapping, vocalisation or any other sign normally associated with pain or distress, 3-80 hours later.
3. Birds that survive ingestion of DRC-1339 show no signs of pathology at either the gross or the microscopic level. Survival studies have been conducted up to 28 days after ingestion. There is no evidence for chronic damage from ingestion of this toxicant.
4. Avian species that are extremely sensitive to DRC-1339 probably die of renal failure. It appears to depress the central nervous system in moderately and slightly sensitive species, but any such effect can be minimised by appropriate design and application of baits.
5. USDA-APHIS-Wildlife Services uses DRC-1339 to manage several bird species that damage a variety of agricultural and non-agricultural resources.
6. For more than 50 years, DRC-1339 has proven to be an effective method of starling, pigeon, blackbird, corvid, and gull damage management.
7. DRC-1339 has been assessed as relatively humane and suitable for further investigation into potential use in Australia (Dawes 2006, Bentz et al. 2007) and is registered in New Zealand.
8. DRC-1339 is a slow acting avicide that is metabolized or excreted in birds and mammals within a matter of hours.
9. DRC-1339 poses little risk of secondary poisoning to non-target animals, including avian scavengers.
10. DRC-1339 poses no risk to aquatic non-target wildlife.
11. Non-target birds and mammals that are sensitive to DRC-1339 may be at risk to DRC-1339, but this risk can be reduced by following procedures designed to reduce exposure.
12. Risks to pollinators and terrestrial plants is negligible based on the use pattern of DRC-1339 and available limited effects data.
13. The use pattern, and application method and rates result in negligible risk for the public.
14. Dietary risk from DRC-1339 exposure to the public is extremely low since the avicide has no registered food uses and does not pose a threat to drinking water.
15. The risk to applicators is extremely low because they receive training in the product's use, are certified to use DRC-1339, and follow label instructions, including the use of appropriate PPE.
16. The release of DRC-1339 into the environment is expected to have no or negligible cumulative impacts to non-target species, the public, and the environment.

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Professor Joan Dawes, who is a professional biochemist, volunteer animal welfare worker, and Member of the Board of Directors of the Invasive Animals Cooperative Research Centre, Canberra.

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