

EFFICACY AND METHODOLOGY OF URBAN PIGEON CONTROL WITH DRC-1339

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Abstract: During 1990 and 1991, feral pigeon (*Columbia livia*) baiting programs using compound DRC-1339 were conducted in 6 cities in Kentucky and Tennessee. U. S. Department of Agriculture, Animal and Plant Health Inspection Service, Animal Damage Control (ADC) personnel evaluated each problem site, selected bait sites, supervised prebaiting, mixed, and applied toxic bait. In most cases, local personnel conducted the prebaiting and disposed of dead birds. Seven pigeon flocks containing 95-735 birds were reduced by up to 100% with 1 or 2 baitings with 0.37% DRC-1339-treated bait. Most birds died at their roosting areas or on rooftops where they were not visible to the public. Use of the bait sites by nontarget birds was minimal, and no nontarget kills were found during carcass pickup. DRC-1339 appears to be a very effective, selective, and safe means of urban pigeon population reduction.

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Uncontrolled feral pigeon populations may create problems in urban areas if their droppings accumulate on buildings, sidewalks, automobiles, and other structures. Large concentrations of droppings in roosting areas may contain the pathogenic fungi *Histoplasma capsulatum* or *Cryptococcus neoformans*, and at least 40 other diseases or parasites that can be transmitted to humans are associated with pigeons or pigeon excreta (Weber 1979).

Management options for nuisance urban pigeons are becoming increasingly limited by cost-effectiveness, lack of availability of registered toxicants, and public attitudes toward control methods. Many cities and towns have traditionally poisoned pigeons with toxic baits such as strychnine, or held organized pigeon shoots periodically to keep populations in check. In 1988, all Environmental Protection Agency (EPA) registrations for above-ground uses of strychnine were temporarily cancelled (Thomas 1988), leaving Avitrol (4-aminopyridine) as the only oral pigeon toxicant available for general use (use of trade names does not imply endorsement of products by the USDA). When used as labeled, Avitrol is a repellent intended to move birds away from a specific site. Although Avitrol is effective in many situations, the erratic behavior and visible distress of birds after ingestion of the toxicant can create public outcry. Organized pigeon shoots can be an effective control method (Hoy and Bivings 1987), however this practice often meets with negative media coverage and strong opposition from certain segments of the public, forcing some communities to abandon shooting and seek other solutions. Live-trapping followed by euthanasia can be effective. However, traps are expensive to construct and tend, the desired level of control may require several weeks or months of

intensive effort, and some birds may be trap-shy and difficult to capture. Ornitrol (20,25-diazacholestenol dihydrochloride) is currently registered as a chemosterilant for pigeons. However, it is difficult to treat the entire target population repeatedly for the necessary 7-10 days, the effects are short-term, and sterilants only slow population growth rather than reducing numbers.

Compound DRC-1339 (3-chloro-4-methylbenzenamine HCL) is a relatively slow acting avicide that is highly toxic to starlings (*Sturnus vulgaris*), blackbirds (Icteridae), crows (*Corvus brachyrhynchos*), and pigeons. Also, it is less toxic to most nontarget raptors and mammals. DeCino et al. (1966) reported Compound DRC-1339 LD₅₀ values of 3.8 mg/kg for starlings, 1.8-3.2 mg/kg for red-winged blackbirds (*Agelaius phoeniceus*), 1.8 mg/kg for crows, 17.7 mg/kg for pigeons, 320-1,000 mg/kg for Cooper's hawks (*Accipiter cooperii*), and >1,000 mg/kg for rats. Birds ingesting a lethal dose usually die within 3-50 hours, and become listless and inactive during the hours immediately prior to death. Secondary-poisoning hazards to raptors and mammals appear to be low due to the relatively low toxicity of the compound to these animals, and the near-complete metabolism or excretion of the chemical prior to the death of the target birds (Cunningham et al. 1980). DRC-1339 was first registered in 1967 as a 1% pelleted bait for starling control at livestock feedlots (Glahn 1982), and is commercially available as Starlicide Complete (Ralston-Purina Company, St. Louis, Missouri). No national EPA registration has been obtained for DRC-1339 use on feral pigeons, although 8 states currently have Section 24(c) (Special Local Need) registrations (E. W. Schafer, Denver Wildlife Research Center, pers. commun.). Section 24(c) registrations for feral pigeons were obtained in Kentucky during September 1988, and in Tennessee during May 1989. DRC-1339 98% Concentrate can be purchased and used only by ADC employees or persons working under their direct supervision. This paper summarizes methods and results of pigeon-baiting programs conducted in 6

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cities in Kentucky and Tennessee between May 1990 and February 1991.

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STUDY AREAS AND METHODS

Baiting programs were conducted in 5 Kentucky cities: (1) Mount Sterling (May 1990); (2) Somerset (2 baitings; Nov-Dec 1990 and Feb 1991); (3) Bowling Green (Mar 1991); (4) Hawesville - National Southwire Aluminum Plant (2 baitings; Mar and Mar-Apr 1991); and (5) Elizabethtown (2 baitings; Dec 1990 and Mar-Apr 1991). A program was also conducted in the city of Sevierville, Tennessee, (Jan-Feb 1991). ADC personnel evaluated each problem site, selected bait sites, supervised prebaiting, and mixed and applied toxic bait. Visual estimates of pigeon numbers at each site were made before and after baiting. In most cases, local city or county personnel conducted the prebaiting and disposed of dead birds, although ADC personnel conducted the first baiting in Hawesville and handled all aspects of the project in Somerset. ADC involvement was funded by the cities through cooperative agreements that ranged from \$450-\$6,158.

Prebaiting Procedures

Bait sites were established near known pigeon feeding, roosting, or loafing areas in locations not readily accessible to people, pets, and nonavian wildlife, as directed by label instructions. Most bait sites were flat rooftops of downtown buildings, although rooftops and other structures at feed mills were also used in Somerset and Sevierville. In Hawesville, the roof of an industrial building and a nearby gravel area where pigeons obtained grit were used. A flock roosting under a highway overpass was baited on the ground directly beneath the roost in Elizabethtown. The number of bait sites used ranged from 1 (Elizabethtown highway flock) to 8 (Bowling Green), with a median of 2. Usually several sites were selected and initially prebaited. Only those with good bait acceptance after 1 week were maintained. Bait was placed in wide bands rather than in piles so most birds could feed at once. Whole corn was the bait used in all but 2 of the baitings, because whole corn is readily accepted by pigeons and is not likely to be consumed by small songbirds (Courtsal 1983). A mixture of whole and cracked corn was used at Mt. Sterling and on the downtown flock in Elizabethtown, where acceptance of cracked corn was higher than acceptance of whole corn. Allowable baits listed on the DRC-1339 label include oat groats, cracked corn, whole corn, commercial wild bird seed, and commercial pigeon mix.

Prebaiting continued for 10-33 days before toxic bait was used (Table 1), depending on degree of bait acceptance, weather conditions, and the work schedule of ADC and city personnel. During prebaiting, ADC or city personnel conducted periodic observations of the bait sites to evaluate

feeding activity of pigeons and nontarget species. The quantity of bait used during the final days of prebaiting was recorded to determine the amount of DRC-1339-treated bait needed.

DRC-1339 Baiting Procedures

A 0.37% bait formulation was prepared according to label instructions by dissolving 37.8 g of DRC-1339 98% concentrate and 18 g of cornstarch in 0.95 L of water. This mixture was poured or sprayed onto 9 kg of grain material and mixed by hand until evenly distributed over the bait. When more or less than 9 kg of treated bait was needed, the proportions of all other ingredients were adjusted accordingly. The prepared bait was then spread in a thin layer on a wire screen or plastic sheet and allowed to air dry overnight. DRC-1339-treated bait is often diluted with untreated, "clean" bait prior to application (Knittle 1989). However, supplemental labeling for the Kentucky and Tennessee 24(c) registrations suggest mixing 2 parts treated bait with up to 5 parts untreated bait. No minimum dilution rate is specified. Treated bait was used without dilution in these projects because preliminary work and an earlier report by Bollengier (1968) suggested that pigeons may reject DRC-1339-treated bait in favor of untreated when available. Our objective was to give birds no alternative other than treated bait.

Treated bait was distributed in the same manner and approximately the same time of day as for prebaiting. Treated bait was not exposed during rain, or when rain was predicted during the next 24 hours. The amount of DRC-1339-treated bait exposed was approximately equal to the amount of prebait consumed per day during the last few days of prebaiting. Bait sites were observed either intermittently or continually by ADC personnel during toxic bait exposure to evaluate pigeon feeding activity and check for the presence of nontarget species. After 1-3 days of exposure, remaining bait was collected and disposed of according to label instructions (landfill burial). Searches of city streets and sidewalks, rooftops, and pigeon-roosting areas were begun the first day after bait exposure, and continued for several days after treated bait was removed. Efforts were made to collect pigeon carcasses visible to the public as quickly as possible, while those in inconspicuous areas were often left for several days and picked up all at once. Pigeon carcasses were buried in a landfill.

Public Relations

Advantages and disadvantages of various pigeon population control options were discussed with the cooperators before operational work began, and the decision to use a toxicant was made by the local officials. We provided literature on the health hazards and nuisance problems associated with pigeons, and technical information on DRC-1339 toxicity, mode of action, and potential secondary hazards, so officials could respond to inquiries from the public and provide news releases to media sources, if necessary. In most cases, officials wished to avoid media attention but responded to questions or complaints when they arose. A fact sheet on DRC-1339 had been prepared to assist with dissemination of information on toxic baiting (Appendix A).

RESULTS

Pigeon flocks of 95-735 birds were reduced by 89-100% with 1 or 2 DRC-1339 baitings (Table 1). Acceptance of both prebait and treated bait was high during the first baiting, but was somewhat lower if the remaining flock was baited a second time (Somerset and Hawesville). In most cases, less than one-third to half of the treated bait was consumed (Table 2). The only birds other than pigeons observed at the bait sites were occasional starlings and common grackles (*Quiscalus quiscula*), both of which are listed as target species on the Kentucky and Tennessee 24(c) registrations. No dead nontarget animals were found. Most dead pigeons were recovered from downtown rooftops. However, at the industrial site in Hawesville, most carcasses were found on the ground underneath roosting areas. In Elizabethtown, where birds were baited underneath a highway overpass, most carcasses were recovered on the ground beneath the overpass. The most detailed record of carcass recovery is from Somerset, where 303 (59%) were on the rooftop used as a roost, 198 (38%) were on other downtown rooftops, and 14 (3%) were picked up from streets and sidewalks. The only significant media coverage was in Somerset, where the pigeon situation had already received national media attention following a pigeon shoot several years ago.

DISCUSSION

Pigeon control with either toxic-baiting or live-trapping is generally most effective during extremely cold weather, preferably when snow cover limits availability of other foods. Temperature and weather conditions were not recorded in this study. However, 5 of the baitings were conducted during March, April, or May, when temperatures are mild in Kentucky and Tennessee. Snow cover was present only during the December Elizabethtown baiting (downtown flock). Although

desirable, extreme weather conditions do not appear to be necessary for successful control.

Knittle (1989) summarized 12 unpublished reports where 1%, 0.5%, 0.37%, or 0.25% DRC-1339 bait formulations were used either undiluted or diluted up to 5:1 (untreated:treated) with untreated bait for pigeon control. Bait shyness and regurgitation of treated bait within a few minutes of ingestion were noted in many of these reports, and were most evident when 1% DRC-1339-treated baits were used undiluted. When 1% bait was diluted with untreated bait, or lower concentrations were used undiluted, bait acceptance and degree of control were higher. Taste and/or odor differences in the treated bait seemed to be a primary factor in developing bait shyness. However, in at least 3 of the reports, part of the bait shyness was also attributed to a darkening of the treated bait to a reddish-brown color within a few days after mixing. Bait shyness, regurgitation, and bait discoloration were also observed in our study.

Reasons for diluting a toxic bait with untreated bait are to: (1) increase bait acceptance by target birds; (2) reduce probability that nontarget birds feeding at the bait site will ingest a lethal dose; and (3) reduce the amount of toxicant ingested in order to minimize the amount of toxicant remaining in the flesh and digestive tract of dead birds. Although some bait shyness and regurgitation were seen in this study, most birds ingested lethal doses of DRC-1339, and bait shyness was not a limiting factor with 0.37% bait. Higher concentrations of DRC-1339 in baits may require dilution with untreated grain for good bait acceptance. Hazards to nontarget birds appeared to be minimal in our study, regardless of dilution rate. One possible benefit of using undiluted bait is that control is achieved quickly. In most cases treated bait was exposed for only 1 day, and never more

Table 1. Duration of prebaiting, toxic baiting, and consumption of DRC-1339-treated bait during pigeon control programs conducted in Tennessee and Kentucky, May 1990-April 1991.

Location	Prebaiting Period (Days)	Baiting Period (Days)	Quantity DRC-1339 Bait Used (kg)	Quantity DRC-1339 Bait Consumed (kg)
Mt. Sterling, Ky.	14	1	13.5	Unknown
Somerset, Ky.				
First Baiting	13	3	33.7	9.0
Second Baiting	14	3	1.4	<1.4
Bowling Green, Ky.	10	1	32.4	10.8
Hawesville, Ky.				
First Baiting	16	2	13.5 ^a	5.4
Second Baiting	31	1	5.4	1.8
Elizabethtown, Ky.				
Downtown Flock	20	1	13.5	<6.8
Highway Flock	33	1	5.4	<5.4
Sevierville, Tenn.	10	3	9.0	<4.5

^a 13.5 kg of discolored bait was used the first day with very little bait acceptance. This was replaced with freshly mixed bait the second day.

Table 2. Pigeon population estimates and efficacy data for DRC-1339 baiting programs conducted in Tennessee and Kentucky, May 1990-April 1991.

Location	Original Population	Carcasses Recovered	Postbaiting Population	Percent Reduction
Mt. Sterling, Ky.	600	75	0	100
Somerset, Ky.				
First Baiting	600	499 ^a	40	93
Second Baiting	40	16 ^b	30	25
Bowling Green, Ky.	735	300	75	90
Hawesville, Ky.				
First Baiting	400	57	45	89
Second Baiting	45	21	<12	73
Elizabethtown, Ky.				
Downtown Flock	350	325	2	99
Highway Flock	95	75	<10	89
Sevierville, Tenn.	250	179 ^a	<10	96

^a Includes carcasses that were located but could not be retrieved.

^b Some mortalities were from the first baiting.

than 3 days (Table 1). This limits the length of time nontarget animals have access to treated bait.

DeCino et al. (1966) reported that the time to death of starlings poisoned with DRC-1339 varied from 3-50 hours, depending on the dose received. Varying the bait concentration and dilution rate could cause birds to die in areas where the carcasses would not be a problem. At the 0.37% DRC-1339 treatment rate on whole corn, a minimum lethal dose for pigeons is approximately 6 kernels. Pigeons can consume a maximum of 17-22 kernels per hour during the first hour of the day, and average 8-12 kernels per hour over an entire day (Schafer and Escher 1985). Assuming that most pigeons fed heavily at the bait site early in the day and consumed more than 1 lethal dose, undiluted bait may have caused pigeons to die quicker and be more concentrated in desirable locations (roosts) than would diluted bait. Cunningham et al. (1980) reported that starlings given up to 26 times their LD₅₀ dosage excreted or metabolized more than 90% of the DRC-1339 within 30 minutes. Starlings that died contained very small amounts (1-2 ppm) of DRC-1339 residues, regardless of dosage level or time to death. They concluded that the risk of acute secondary toxicity to scavengers is low, although the possibility of chronic toxicity exists for species especially susceptible to DRC-1339 poisoning (i.e., cats [*Felis* spp.], owls [Tytonidae], magpies [*Picapica*]) if their diet consists primarily of poisoned birds for more than 30 days. This information, the differential toxicity between target species and most predators and scavengers (DeCino et al. 1966), and the short-term exposure of pigeon carcasses following baiting operations, indicated that hazards to predators and scavengers was very low.

When pigeon-roosting/loafing areas are clearly identified and available for carcass pickup, use of undiluted bait (if

allowed by the label) may be desirable to obtain a quick kill. When roosting areas are unknown, carcass recovery potentially inadequate, or if acceptance of prebait is marginal and not all pigeons feed at the bait site during one day, dilution with untreated grain may be a better alternative. If undiluted bait is used, we recommend that the amount exposed be no more than half the average amount of prebait consumed per day during the final days of prebaiting.

MANAGEMENT IMPLICATIONS

Compound DRC-1339 provided a very effective means of urban pigeon population reduction, and posed little risk to nontarget animals when used properly. Efforts to obtain a national registration for use on pigeons should continue. Personnel conducting operational baiting programs should maintain detailed records to support registration activities, assist in refining baiting procedures, and document nontarget exposures.

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Appendix A

Fact Sheet: DRC-1339 Avian Toxicant

DRC-1339 is the code name for the chemical compound 3-chloro-4-methylbenzenamine HCL ("DRC" stands for the Denver Research Center of the USDA, which developed the compound for use in bird control). This compound has been commercially available in a 1% formulation for many years, in the form of Starlicide pellets for starling control around animal feedlots. It has recently been registered in a 98% concentrate for use on starlings, blackbirds, crows, and feral pigeons in Kentucky and Tennessee. The 98% concentrate is a restricted use pesticide (RUP), and according to the EPA label it can only be purchased and used by USDA, APHIS, ADC employees or persons working under their direct supervision.

DRC-1339 is a relatively slow-acting avian toxicant that is highly toxic to starlings and other pest birds, and much less

toxic to mammals and nontarget birds. Birds ingesting a lethal dose of the compound usually die within 3-50 hours. They are active and able to fly within 1-4 hours of death, at which time they become listless and inactive. Death appears to be painless, and results from uremic poisoning and generalized circulatory impairment of the major organs. Almost all of the toxicant is metabolized by the body before death, and there is little danger of secondary poisoning to raptors, pets, or other wildlife that might eat poisoned birds. During laboratory tests, hawks that were fed a steady diet of poisoned starlings for up to 135 days suffered no ill effects. Careful selection of the bait site and formulation of bait used, and monitoring of the bait site before and during toxic baiting greatly minimizes any risk to nontarget birds. Bait sites should be located in areas that are not readily accessible to humans, pets, or domestic animals.

In practical use, birds must be "prebaited" for 1-3 weeks using the same type of bait (i.e., whole corn, bread, etc.) to which the toxicant will be applied. After good bait acceptance is achieved, USDA, APHIS, ADC personnel will mix and apply the toxic bait and monitor the bait site. After 1-3 days of bait exposure, any uneaten bait should be removed and disposed of according to label instructions. Most birds will die at night at roost sites, but some will die during the day and may be found some distance from feeding or roosting areas. Arrangements should be made for carcass pick up and disposal, either by burial in a landfill or incineration. Several baitings may be necessary to achieve the desired level of control.

DRC-1339 has been shown to be very effective in reducing feral pigeon populations with only 1 or 2 baitings. It is somewhat effective at starling control in structural roosts (i.e., industrial facilities, towers, and electrical power stations), although several baitings may be needed to achieve a significant population reduction. At this time, DRC-1339 has not been proven effective at significantly reducing major winter blackbird/starling tree roosts. However, this toxicant has successfully reduced crow use of sensitive areas such as airports.