

AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523
BIBLIOGRAPHIC INPUT SHEET

FOR AID USE ONLY

1. SUBJECT CLASSIFICATION	A. PRIMARY Agriculture	AH00-0000-0000	
	B. SECONDARY Plant protection		
2. TITLE AND SUBTITLE Hazards to animals feeding on blackbirds killed with 4-aminopyridine baits			
3. AUTHOR(S) Schafer, E.W.; Brunton, R.B.; Lockyer, N.F.			
4. DOCUMENT DATE 1974	5. NUMBER OF PAGES 4p.	6. ARC NUMBER ARC	
7. REFERENCE ORGANIZATION NAME AND ADDRESS Interior			
8. SUPPLEMENTARY NOTES (<i>Sponsoring Organization, Publishers, Availability</i>) (In J. of wildlife management, v.39, no.3, p.424-426)			
9. ABSTRACT			
10. CONTROL NUMBER PN-RAA-631		11. PRICE OF DOCUMENT	
12. DESCRIPTORS Blackbirds Contaminants Wildlife		13. PROJECT NUMBER	
		14. CONTRACT NUMBER PASA RA(ID) 1-67 Res.	
		15. TYPE OF DOCUMENT	

**HAZARDS TO ANIMALS FEEDING ON BLACKBIRDS
KILLED WITH 4-AMINOPYRIDINE BAITS**

By E. W. SCHAFER, JR., R. B. BRUNTON AND N. F. LOCKYER

Made in United States of America
Reprinted from **THE JOURNAL OF WILDLIFE MANAGEMENT**
Vol. 38, No. 3, July, 1974
pp. 424-426

HAZARDS TO ANIMALS FEEDING ON BLACKBIRDS KILLED WITH 4-AMINOPYRIDINE BAITS

E. W. SCHAFER, JR., U.S. Fish and Wildlife Service, Wildlife Research Center, Denver, Colorado 80225

R. B. BRUNTON, U.S. Fish and Wildlife Service, Wildlife Research Center, Denver, Colorado 80225

N. F. LOCKYER, U.S. Fish and Wildlife Service, Wildlife Research Center, Denver, Colorado 80225¹

Abstract: Red-winged blackbirds (*Agelaius phoeniceus*) killed by ingesting cracked corn baits treated with 3 percent 4-aminopyridine, or by oral doses of 4-aminopyridine, were fed to canines, laboratory rats (*Rattus norvegicus*), black-billed magpies (*Pica pica*), and three species of hawks. The test animals consumed the equivalent of up to 3.4 LD₅₀ doses of 4-aminopyridine in single feedings and up to 3.2 LD₅₀ doses a day for 20 days in repeated feedings. None showed any symptoms of intoxication or gross abnormalities at necropsy.

J. WILDL. MANAGE. 38(3):424-426

The chemical frightening agent, 4-aminopyridine (4AP), has been registered for protecting ripening field corn from blackbird damage (EPA Registration No. 11649-12). In use, cracked corn baits are treated with 3 percent 4AP, diluted 1 to 99 with untreated corn, and broadcast in fields being damaged. Blackbirds (primarily redwings) that ingest treated particles give distress reactions that frighten away the rest of the flock (De Grazio et al. 1972, Stickley et al. 1972). The acute, subacute, and chronic toxicity of 4AP to birds and other animals has been summarized (Schafer et al. 1973; Schafer and Marking, unpublished manuscript). However, since redwings affected or killed by 4AP may be eaten by flesh-eating birds or mammals, the following study was conducted to determine if 4AP would be likely to present secondary hazards to these animals.

METHODS

Orally treated redwings were fed to all test animals. To achieve high doses of 4AP, some redwings were gavaged with 4AP in propylene glycol; after death the carcasses were immediately frozen at -20 C until fed

to the test animals. All other redwings were killed by using simulated baiting conditions in which 20-40 birds of mixed ages and sexes were released in a 1.8- × 1.8- × 1.8-m holding cage and offered a cracked corn mixture containing 99 parts of untreated particles and 1 part of particles treated with 3.0 percent by weight 4AP (a total of 300 ppm 4AP). No other food was present; water was available ad libitum. Individual redwings died 15 minutes to 12 hours after ingesting one or more particles containing 4AP and were immediately frozen at -20 C. For calculating the minimum amount of 4AP available to test animals, we assumed that each dead redwing consumed one treated particle of average weight (22 mg), or 0.66 mg 4AP.

For canines and rats, partially thawed redwing carcasses, minus skin, beak, and feet, were minced in a food chopper. For canines, the minced redwings were then mixed with one-third by weight of "bite-size" dry dog food (to improve palatability and acceptability) and passed twice through a meat grinder to reduce bone fragments to minimal size. For rats, oatmeal was substituted for dog food. Foods were prepared less than 4 hours before consumption and were refrigerated until use. For flesh-eating

¹ Present address: P. O. Box 35, Saugatuck, Michigan 49453.

birds, whole, frozen redwing carcasses were offered daily.

All animals were observed daily for sublethal or lethal effects of 4AP intoxication (Schafer et al. 1973), particularly hyperactivity and tremors. At the termination of each test, all animals (except for one hawk) were sacrificed and examined for gross pathological changes of internal organs.

RESULTS

Canines

One individually caged adult female beagle-coyote hybrid (*Canis familiaris* × *Canis latrans*) and one individually caged adult male beagle were each fed 175 grams of the redwing-dog food mixture twice daily for 8 days. Both animals received additional food and water between test feedings. They consumed an average of 4.8 birds per day, the equivalent of 0.4 mg/kg of 4AP per day, or a total of 3.2 mg/kg. (Although the fate of 4AP in redwings is not known, all data are expressed as equivalent amounts of 4AP as if no metabolism had taken place.) Two weeks later the beagle consumed, within 3 minutes, food containing 10 redwings killed by oral administration of 40 mg/kg (26.8 mg) of 4AP. For the beagle, this was equivalent to 2.7 mg/kg of 4AP, or 50 redwings each killed with one 3 percent bait.

At the end of an additional 2 weeks, the beagle consumed food containing 10 redwings killed by oral administration of 100 mg/kg 4AP (equivalent to 5.8 mg/kg for the beagle). The acute oral LD₅₀ to dogs is 3.5 mg/kg (Schafer et al. 1973). At the same time, the female hybrid consumed food containing 10 redwings killed by oral administration of 150 mg/kg. This was equivalent to a dose of 8.2 mg/kg of 4AP, or 150 redwings each killed with one 3 percent bait. Neither canine showed any detectable

effects from eating 4AP-killed redwings, and 2 weeks after the last feeding both animals were sacrificed. A gross pathological examination revealed no abnormalities.

Rats

Ten individually caged white laboratory rats were offered only food containing 4AP-killed redwings for 21 days. Ten other rats were given food containing untreated redwings. Average daily food consumption for the treated rats was 45.8 grams, or 0.5 mg/kg of 4AP. Since the acute oral LD₅₀ of 4AP to rats is 20 mg/kg (Schafer et al. 1973), each rat received an average of 1.3 LD₅₀ doses during the 21-day test. None showed symptoms of intoxication, and at the end of the test gross pathological examination showed no differences between treated and control rats.

Five individually caged rats were fasted for 18 hours and then offered food containing one redwing that had been orally dosed with 100, 150, 200, 250, or 300 mg/kg of 4AP. The 300-mg/kg bird was equivalent to an acute dose of 67 mg/kg for the rat, or 3.4 LD₅₀ doses. All the rats consumed the food within 3 hours, none exhibited symptoms of intoxication, and none showed any pathological changes in internal organs.

Magpies

Two individually caged black-billed magpies were fed 4AP-killed redwings for 20 days; one was given one bird per day and the other two. A third magpie was fed untreated redwings. All birds also had water and a weighed amount of CF laying ration available ad libitum. The magpie that ate one redwing daily consumed the equivalent of 3.9 mg/kg 4AP per day, and the magpie that ate two birds daily consumed the equivalent of 7.5 mg/kg per day, or 3.2

times the acute oral LD₅₀ of 2.4 mg/kg (Schafer et al. 1973); neither showed intoxication symptoms nor any internal pathological differences when compared to the untreated magpie.

Hawks

A female sharp-shinned hawk (*Accipiter striatus*) was fed 37 4AP-killed redwings over 21 days, the equivalent of 6.4 mg/kg per day. She showed no intoxication symptoms and a gross pathological examination indicated no abnormalities. A subadult male red-tailed hawk (*Buteo jamaicensis*) was similarly fed 39 4AP-killed redwings over 14 days, without symptoms of intoxication.

Three individually caged American kestrels (*Falco sparverius*) were fed 4AP-killed redwings for 7, 21, and 45 days. Three individually caged controls were fed the same number of untreated redwings. The hawks fed 4AP-killed redwings consumed 7, 21, and 58 birds, respectively, or the equivalent of 5.5–6.1 mg/kg 4AP per day. The acute oral LD₅₀ of 4AP to kestrels is 5.6 mg/kg (Schafer et al. 1973). The treated birds showed no symptoms of intoxication, and gross pathological examination revealed no differences between them and the controls.

DISCUSSION

Although most of these tests were conducted with limited numbers of animals,

they suggest that secondary hazards to flesh-eating birds and mammals will not be a problem with 4AP baits when used as described by De Grazio et al. (1972) and Stickley et al. (1972). Apparently, when the compound is consumed by redwings, it is rapidly metabolized so that what would theoretically be a multiple LD₅₀ dose is not toxic to an animal eating the bird. In our studies, this was particularly evident in canines and rats, which consumed the equivalent of up to 3.4 LD₅₀ doses within minutes or hours with no apparent effects, and with magpies, which consumed the equivalent of 3.2 LD₅₀ doses a day for 20 days, again with no apparent effects. Judging from the results of the longer-term feedings, the flesh-eating species tested could live unharmed on an exclusive diet of redwings killed with 3 percent baits during a 4AP baiting program.

LITERATURE CITED

- DE GRAZIO, J. W., J. F. BESSER, T. J. DECINO, J. L. GUARINO, AND E. W. SCHAFFER, JR. 1972. Protecting ripening corn from blackbirds by broadcasting 4-aminopyridine baits. *J. Wildl. Manage.* 36(4):1316–1320.
- SCHAFFER, E. W., JR., R. B. BRUNTON, AND D. J. CUNNINGHAM. 1973. A summary of the acute oral toxicity of 4-aminopyridine to birds and mammals. *Toxicol. Appl. Pharmacol.* 26(4):532–538.
- STICKLEY, A. R., JR., R. T. MITCHELL, R. G. HEATH, C. R. INGRAM, AND E. L. BRADLEY, JR. 1972. A method for appraising the bird repellency of 4-aminopyridine. *J. Wildl. Manage.* 36(4):1313–1316.

Accepted 25 April 1974.