AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

BIBLIOGRAPHIC INPUT SHEET

FOR AID USE ONLY

1. SUBJECT CLASSIFICATION

A. PRIMARY
Agriculture — AH10-0120-0000

B. SECONDARY
Pests of plants--Cereals--Maize

2. TITLE AND SUBTITLE
Protecting ripening corn from blackbirds by broadcasting 4-aminopyridine baits

3. AUTHOR(S)
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4. DOCUMENT DATE	5. NUMBER OF PAGES	6. ARC NUMBER
1972	6p.	ARC

7. REFERENCE ORGANIZATION NAME AND ADDRESS
Interior

8. SUPPLEMENTARY NOTES *(Sponsoring Organization, Publishers, Availability)*
(In J.of wildlife management,v.36,no.4,p.1316-1320)

9. ABSTRACT

10. CONTROL NUMBER	11. PRICE OF DOCUMENT
PN-RAA- 606	

12. DESCRIPTORS
Attractants
Blackbirds
Field tests
Maize
Repellents

13. PROJECT NUMBER

14. CONTRACT NUMBER
PASA RA(ID)1-67 Res,

15. TYPE OF DOCUMENT

AID 590-1 (4-74)

PROTECTING RIPENING CORN FROM BLACKBIRDS BY BROADCASTING 4-AMINOPYRIDINE BAITS

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Made in the United States of America
Reprinted from The Journal of Wildlife Management
Vol. 36, No. 4, October 1972
pp. 1316–1320

PROTECTING RIPENING CORN FROM BLACKBIRDS BY BROADCASTING 4-AMINOPYRIDINE BAITS

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Abstract: Broadcasting 4-aminopyridine-treated baits in cornfields in an 8-section study area in Brown County, South Dakota, in 1965 reduced damage by red-winged blackbirds (*Agelaius phoeniceus*) to ripening corn in the study area from an expected loss of 5.58 bushels per acre, obtained by projecting loss data from this area during 1961–63, to an actual loss of 0.82 bushel per acre (85 percent). Cracked corn treated to contain 3 percent 4-aminopyridine was diluted with 29 parts of untreated corn and hand-broadcast within 1,129 acres of cornfields at the rate of 1 pound of diluted bait per acre (1 pound of 4-aminopyridine per 1,000 acres). Fields were retreated at about weekly intervals during the milk and dough stages of ripening. The distress behavior exhibited by blackbirds affected by 4-aminopyridine produced a marked fright response in other members of the flock, and fields were cleared of blackbirds with less than 1 percent of the estimated population directly affected. Mortality of nontarget species was negligible. Appraisals of damage indicate that about $6,449 worth of corn was saved, at a cost of $634 for treatment.

Chemically treated grains have been used in a variety of situations to reduce bird damage by poisoning birds (Neff and Meanley 1957, Giltz and Stockdale 1960). Goodhue and Baumgartner (1965*a*, *b*) described a new chemical control agent, 4-aminopyridine, that could be used to frighten flocks of birds from problem areas by means of its unique effect on the behavior of the few birds that ingested it. In a study in South Dakota, De Grazio et al. (1971) found that spraying partially husked ears of corn with 4-aminopyridine reduced expected blackbird damage by about 70 percent. However, the technique of spraying ears with the chemical is time-consuming because treatment cannot be made by machine, and treated ears must be removed from the fields before harvest. Therefore, an alternative method of pro-

[1] Deceased.

tecting fields with 4-aminopyridine was sought. This paper reports the results of a study made in 1965 to evaluate broadcasting of treated cracked corn baits within cornfields.

We acknowledge field assistance given by R. R. West, P. P. Woronecki, C. V. Grant, T. Williams, and C. M. Loveless of the Denver Wildlife Research Center; by L. J. Schoonover, Sand Lake Refuge Manager; by summer employee R. R. Martinka; and by A. J. Reinert and H. Hyatt of the Phillips Petroleum Company. Ann H. Jones of the Denver Wildlife Research Center reviewed the manuscript.

METHODS AND MATERIALS

The 8-section test area, within a 94-section survey area adjoining Sand Lake National Wildlife Refuge, Brown County, South Dakota, was the one used by De Grazio et al. (1971). The test area contained 50 cornfields totaling 1,129 acres. These fields were located from a few hundred feet to 2 miles from marshes used by blackbirds for roosting.

Cracked corn, screened through a No. 6 U. S. Standard Sieve and retained on a No. 7 Sieve, with an average particle weight of about 25 mg, was used as bait. These particles were treated with 4-aminopyridine in a methanol-acetone-latex solution to contain 3 percent 4-aminopyridine by weight. An 80-gram red-winged blackbird taking a treated particle would obtain about 9 mg/kg of body weight. We found that this dosage produced the optimum distress reaction. To protect against killing granivorous species larger than blackbirds, such as ring-necked pheasants (*Phasianus colchicus*), treated corn was diluted with 29 parts of untreated cracked corn. (For additional safety and economy, a 1:99 dilution ratio broadcast at 1 pound of diluted bait per acre was subsequently tested: Federal registration for this rate was granted in April 1972.

Fields were baited one to seven times between August 10 and September 12. The fields were observed closely for bird activity and were baited as soon as damage was noted. Bait was broadcast thinly by hand over about 25 percent of a field. The bait was scattered in swaths 8 to 10 rows wide every 30 to 35 rows. To reduce hazards to nontarget species that frequented edge cover, bait was not placed within 100 feet of the field edge. The treatment rate per field for each application was 1 pound of diluted bait per acre (1 pound of 4-aminopyridine per 1,000 acres). One person could bait about 30 acres per hour.

The normal movement pattern of birds feeding in the test area during a typical pretreatment day was similar to that described by De Grazio et al. (1971). To evaluate the effect of treatment, populations were estimated on and off the test area. A 10-mile route that crossed all sections within the test area was censused by driving between 7 AM and 9 AM three times weekly, from August 6 to September 22. Weekly counts were also made of birds that crossed the test area on three flight lines from the roost, and these counts were compared with similar estimates made in 1962 and 1963.

Twenty randomly selected rows in each of four fields were searched weekly to obtain an estimate of the total kill of blackbirds and other species. Two of the four fields received heavy bird presure; one received medium, and one, light pressure. Since observations showed that only the 3.3-foot space on either side of a corn row could be covered without missing some of the dead birds hidden by weeds, all estimates were based on a transect width of 6.6 feet.

Damage was assessed in late September

Table 1. Damage reduction, calculated from pretreatment data (1961–63) in 37 of 50 cornfields baited with 4-aminopyridine for blackbird control.

Expected Damage Intensity	Number		Loss (bushels/acre)[a]		Percent Loss Reduction
	Fields	Acres	Actual	Expected	
Heavy	8	141	3.18	11.20	72
Medium	22	473	0.42	5.01	92
Light	7	192	0.10	2.89	97
Mean			0.82	5.58	85

[a] Chi-square analysis indicates a highly significant difference in all damage categories ($P < 0.01$).

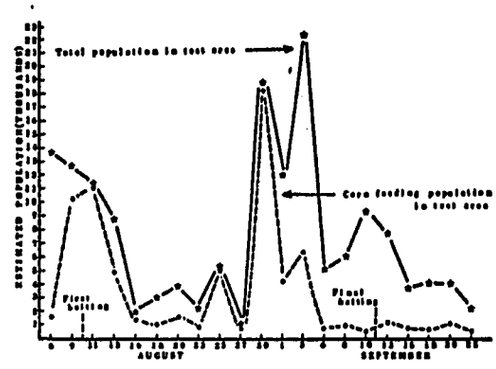

Fig. 1. Blackbird population trends in the 4-aminopyridine-treated test area, August 6–September 23, 1965.

in all 50 test fields by the method of De Grazio et al. (1969). Expected damage for test fields was calculated by projecting data for corn loss obtained while surveying 37 of these fields by the same method used in 1961, 1962, and 1963.

RESULTS AND DISCUSSION

Estimates of damage indicated that loss of corn to blackbirds in the test area averaged 0.82 bushel per acre. Table 1 shows the actual versus the expected losses in the 37 test fields for which data on losses were available for pretreatment years (1961–63). In these fields, expected damage was reduced about 85 percent from the expected rate of 5.58 bushels per acre. The effectiveness of broadcasting 4-aminopyridine-treated baits may have been enhanced by spraying a formulation of 4-aminopyridine on partially husked ears of corn in this test area the previous year (De Grazio et al. 1971), but the degree of enhancement could not be determined.

The number of baitings during the 34-day treatment period averaged three per field. Fields that received the heaviest damage required one baiting every 7 days, or about five per season; moderately damaged fields required one baiting each 8 to 9 days or about four per season; lightly damaged fields were baited only once. One uniquely situated field required baiting every 5 or 6 days, for a total of seven times. It was adjacent to the marsh and shelterbelts that served as unexcelled loafing, escape, and roosting cover; as many as 20,000 male redwings remained in and near this field throughout the damage period.

We did not observe any differences in acceptance of baits by blackbirds between cornfields that had few weeds and those that had many. Weeds, primarily bristlegrass (*Setaria* sp.), covered more than half of the ground in some fields, whereas other fields were nearly weed-free. Neither did we observe any differences in acceptance of baits in fields with poor stands of corn or those with populations of approximately 15,000 plants per acre. However, in several fields, bait disappeared rapidly despite little pressure by birds. Close examination revealed high insect populations in these fields; beetles (*Harpalus* sp.) and crickets (*Gryllus* sp.) appeared to be chiefly responsible for the missing bait.

Blackbirds that ingested baits gave excellent distress displays, causing a marked fright response in other members of the flock. On most occasions, nearly all blackbirds left a treated field after a few (1–10) members of the feeding flock were affected.

The number of affected blackbirds was usually less than 1 percent of the flock.

Information from the census routes and the weekly flyway population estimates showed that populations feeding in cornfields in the test area decreased sharply immediately after treatment began (Fig. 1). They remained at a low level throughout the treatment period, except for a temporary increase about August 30. This increase was probably due to an influx of northern migrants. Numbers of birds crossing the test area fell steadily beginning August 19 on two flight lines and on August 26 on the third. There were approximately 74,500 birds on August 19, 64,500 on August 26, 24,000 on September 2, 10,000 on September 16, and 2,800 on September 23. The 24,000 birds counted in flight lines in the test area in early September 1965 represented 75 percent fewer than were counted in 1962–63, even though the total population was about the same in the 94-section survey area (1.4 million) in the years compared (Table 2).

In the four fields sampled for dead birds, 140 redwings, 1 yellow-headed blackbird (*Xanthocephalus xanthocephalus*), 3 common grackles (*Quiscalus quiscula*), 1 meadowlark (*Sturnella neglecta*), 1 savannah sparrow (*Passerculus sandwichensis*), and 2 mourning doves (*Zenaidura macroura*) were found. Mourning doves were common before, during, and after the study. Of the redwings recovered, 42 percent were killed during the first week of baiting. The number of dead redwings was estimated at 16 per acre on heavily damaged fields, 9 per acre on moderately damaged fields, and 2 per acre on lightly damaged fields. Extrapolating these figures indicated that a minimum of about 7,500 redwings were killed in the treated fields. Our studies in subsequent years showed that less than 30 percent of the affected birds died outside treated fields and that most of these died in adjacent shelterbelts.

Table 2. Peak blackbird populations in early September, Sand Lake National Wildlife Refuge, Brown County, South Dakota.

Year	Estimated Number of Blackbirds		Percent Population in Test Area
	94-section Survey Area	8-section Test Area	
1962 (pretreatment)	1,354,000	92,000	6.8
1963 (pretreatment)	1,434,000	106,700	7.4
Mean	1,394,000	99,000	7.1
1965 (baiting)[a]			
Actual	1,421,000	24,000	1.7
Expected[b]	—	101,000	—

[a] Chi-square analysis indicates a highly significant difference between actual and expected numbers in 1965 ($P < 0.01$).

[b] Based on the current year's population in the 94-section area and the mean proportion of birds in the test area in 1962 and 1963.

On the basis of an average saving of 4.76 bushels per acre in the test area, 5,374 bushels of corn were saved by 4-aminopyridine baiting. At $1.20 per bushel (price in 1965), this amounted to a saving of $6,449 for a treatment costing $634 ($244 for chemicals, $90 for cracked corn, and $300 for labor). Thus, about $10 were saved for every dollar spent for control. We feel that this approach of on-site protection of cornfields is a safe, effective, and practical solution to the problem of blackbird damage to ripening corn.

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Received for publication February 7, 1972.