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HAZARDS TO WILDLIFE IN CORN FIELDS TREATED WITH TEMIK®

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INTRODUCTION

Temik is the trademark of Union Carbide for agricultural chemicals containing aldicarb as the active ingredient. Temik products are effective in controlling a wide variety of insects, mites, and nematodes and are in use worldwide. Aldicarb, the active ingredient, is a potent acetylcholinesterase and is used in granular formulations containing 5% to 20% aldicarb. The 15% formulation used in their studies has an acute oral LD50 for rabbits of 5.3 - 10.6 mg/kg. Ground feeding birds might be exposed to aldicarb by taking up Temik granules that are incompletely incorporated into the soil.

The field trial conducted between 7 May and 14 June 1983 consisted of four treated plots and two reference plots; plots ranged from 15 to 47 acres in size. All fields in the study were located in the immediate area of Blissfield, Michigan. William Erickson, Hidenori Fukui, and Mark Jackson assisted with some of the observations. We acknowledge the support of Union Carbide, especially that of Dr. T. C. DeWitt, Product Development, and Sales Representative Jerry Miller, and the farmers on whose fields the observations were made.

CENSUS METHODS

Field methods included a 10-minute observation period at one corner of each field followed by a perimeter walk and random transect surveys. The total field area surveyed accounted for approximately 10% of the total acreage. Bird numbers and species and carcass recoveries for birds and mammals were recorded on each perimeter/transect walk. Territorial (singing) males in field border areas were mapped during the walk. Edwards et al. (1979) had advocated this procedure in similar field trials.

Pre-treatment observation and carcass recovery were conducted for at least three days on each field. Comparable observations were conducted daily for the first week, then every other day during the second week post-planting. Some variations occurred in the schedule due to weather conditions. General observations were made of mammals and their burrows and tracks. Extensive checks also were made in the ditch bank areas to recover bird or mammal carcasses.

Temik 15G was applied by farmers using standard corn planting equipment in accordance with the label granted under a Federal Experimental Use permit (264-EUP-67). The rate was 1.5 lb ai/A applied in a 7" band and incorporated at planting. Since Temik is highly toxic, particular attention was paid to ends of rows, where spillage could be a problem. Surface spills of fertilizer were noted in one field; Temik granules were not observed on the surface, however.

FIELD SITE OVERVIEW

Isley Farm Plot (Fig. 1)

The Isley field (ca 47 acres) offered the most diverse habitat, being bordered by two

woodlots; a third woodlot was nearby, and ditches bordered on portions of the south, east, and northeast sides. Nine-hundred and fifty birds of 73 species were recorded during the perimeter/transect survey on this field. The large species diversity was due to movement of migratory birds, particularly warblers. Ditches bordering portions of two sides of the field provided nesting areas for red-winged blackbirds. The light sandy soil dried out fairly rapidly, facilitating early planting.

Fisher Farm Plot #1 (Fig. 2)

Fisher field #1 (ca 30 acres) was surrounded by other fields on two sides and a paved road on the east. A shallow ditch (generally dry) bordered the field on the north; a power line running beside the ditch provided perches for territorial red-winged blackbirds.

Fisher Farm Plot #2 (Fig. 3)

Fisher field #1 (ca 23 acres) was surrounded by other crop fields and bordered by ditches on the north and south sides that provided nesting habitat for red-winged blackbirds. The lighter soils in the Fisher #1 and #2 fields facilitated normal planting times. This field served as one of the untreated control fields.

Eisenmann Farm Plot (Fig. 4)

The Eisenmann field (ca 30 acres) was bordered by Rouget Road on the south, other fields on the east and west, and a ditch on the north side. A few trees were present in scattered locations. A stand of winter wheat was situated just north of the ditch. Red-winged blackbirds were common in the ditch/wheat field area. The soils were heavy and took a long time to dry, thus delaying planting until June 1st.

Goetz Farm Plot (Fig. 5)

The treated area of the Goetz field (ca 25 acres) comprised the outer 12 rows (near the Raisin River) of a 150-acre corn field. The field, although diked, had flooded in the spring and the heavy soils were slow in drying. A portion of the field was underwater until early June and was frequented by a variety of shore birds. The spring pond eventually dried out and was planted. Hot weather and rapid evaporation at planting enhanced seed germination and corn emergence. Trees and shrubs along the river bank provided varied habitat for birds; the predominant singing males were indigo buntings.

Brubaker Farm Plot (Fig. 6)

The Brubaker field (ca 15 acres) was located near the Raisin River and was bordered on the south by a woodlot and on the north and west by housing units. A power line adjacent to a field access road paralleled the north end of the field. This field served as one of the untreated control areas. Thirteen acres of land on the east were dedicated to PIK and supported a light cover crop.

RESULTS AND DISCUSSION

A total of 4019 birds of 93 species was identified during the wildlife monitoring study. The red-winged blackbird was the predominant species in the study area, followed by the song sparrow, horned lark, and grackle. The 15 most abundant species of birds (Table 1) were essentially the same as those recorded by Dolbeer and Stehn (1983) during their 16-year analysis of bird populations in North America.

A look at redwing activity (Table 2, Fig. 1, 2, 3, and 4) reveals bird sightings from pre-treatment to post-treatment periods to be fairly consistent. For example, ten pairs were seen consistently throughout the trial at the Isley field (Fig. 1). However, a decline in redwing numbers was noted at both the Fisher #1 and Fisher #2 fields, the second being an untreated control site. The large drop at Fisher #1 was attributed to change in habitat. This field had been planted in clover and supported a good number of birds, but many birds were displaced when the field was plowed. Bobolinks, which were present in both Fisher fields, moved out at plowing time (prior to Temik treatment). This trend also was noted in the song sparrow numbers (Table 3).

Grackle activity increased in most fields after planting. This is due partly to the late May planting of the Eisenmann, Goetz, and Brubaker fields, thus coinciding with the establishment of grackle territories (Table 4).

Bird activity in ditch bank vegetation continued throughout the trial. For example, the ten redwing pairs at the Isley site all had nests with eggs; and when last checked, eight of the ten nests had young. The same pattern was observed at the Fisher #2 control field.

No bird carcasses were recovered during the trial. Two white-footed mice (*Peromyscus leucopus*) carcasses were recovered, one from the Goetz field and one from the Eisenmann field. Analysis of the mice by Union Carbide revealed Temik residues of 0.87 and 2.6 ppm in the body, respectively, and residues of 0.26 and 1.1 ppm, respectively, in the skin. Both mice had corn sprout material in their stomachs and were found within 48 hours of corn emergence. It is considered likely that these mice were Temik victims.

Relatively few mammals were seen during the study period, since twilight or nocturnal observations were not attempted. A female red fox with two cubs was seen at a ditch-bank den adjacent to the Eisenmann field. This group remained active during the observation period.

Other mammals (or their sign) were seen and logged during the study. Deer and burrowing mammals remained active during the entire study period. No changes in activity patterns (in some cases indicated by tracks) were evident, but the observations were too limited to permit formal analysis.

Raptors were rarely seen. There is no trend evident between the pre- and post-treatment observations. We did not see any indication of vultures feeding in any of the fields under observation nor any concentration of hawks in the test areas.

Great-horned owls were observed at intervals during the test in one of the Isley woodlots and may have been nesting there. Screech owls may have been present in woodlots adjoining some fields but were not seen. No observations linked these raptors with the treatment effort. No indication of decreased numbers of raptors during the course of the tests was evident.

Initially statistical treatment of data was desired. However, the planting patterns among the fields were not uniform. Two groups of fields, based on planting dates, were available. Even within these groups, however, fields were not comparable because of specific locations and differing cultural practices. This advised against the use of formal statistical procedures.

Mammal observations were too few and scattered to permit even simple statistical tests. Avian observations focused on resident birds, especially involving the census of singing males. That numbers before and after treatments in both treated and control fields were similar is the basis for judgement of no impact, and statistical tests are not needed. In-field bird populations changed drastically when fields were prepared for planting, some species increasing, others decreasing. These shifts due to habitat changes had no relation to the chemical treatment. In fact, numbers of species and numbers of birds observed remained constant or increased in the test fields during the observation period, further emphasizing the impact of seasonal and habitat changes on data interpretation.

Only two carcasses (white-footed mice) were found (both in treated fields); no further population evaluation was possible. This pattern of mortality would have no impact on small mammal populations that lived in field borders and occasionally ventured into fields to feed on seedlings.

CONCLUSIONS

1. No bird mortality was observed. Numbers of singing males were similar in

- areas adjacent to treated and control fields. No evidence of treatment impact was found for area birds, including raptors.
2. While two mice were found, presumably killed by feeding on newly emerged corn seedlings, this does not constitute any population hazard.
 3. Other small mammals and larger mammals, including fox, were not observed in large numbers; but their activities and general frequency of sightings did not change during the study.
 4. It is concluded that Temik in corn can be used safely relative to wildlife when applied according to label directions.

LITERATURE CITED

- Dolbeer, Richard A. and Robert A. Stehn. 1983. Population status of blackbirds and starlings in North America, 1966-1981. Denver Wildlife Research Center. Bird Damage Research Report. 62 pp.
- Edwards, P. J., S. M. Brown, M. R. Fletcher, and P. I. Stanley. 1979. The use of a bird territory mapping method for detecting mortality following pesticide application. *Agro-Ecosystems* 5:271-282.

TABLE 1. The 15 most abundant species of birds recorded during the Temik wildlife study.

Rank	Species	Number
1	Red-winged blackbird	952
2	Song sparrow	396
3	Horned lark	296
4	Grackle	277
5	Barn swallow	236
6	Starling	173
7	Blue jay	149
8	Mourning dove	149
9	Robin	148
10	Vesper sparrow	87
11	Kildeer	78
12	House sparrow	77
13	Indigo bunting	70
14	Cowbird	67
15	Savannah sparrow	63

TABLE 2. A summary of red-winged blackbird counts during the perimeter/transect census.

Field Site	Pre-Treatment		Post-Treatment	
	No. Birds	(Avg. Birds/Day)	No. Birds	(Avg. Birds/Day)
Isley	91	(22.8)	191	(21.2)
Fisher 1	82	(27.3)	63	(7.9)
Fisher 2	57	(19.0)	112	(12.4)
(Control)				
Eisenmann	22	(7.3)	64	(6.4)
Goetz	4	(1.3)	18	(0.7)
Brubaker	0	(0.0)	0	(0.0)
(Control)				

TABLE 3. A summary of song sparrow counts during the perimeter/transect census.

Field Site	Pre-Treatment		Post-Treatment	
	No. Birds	(Avg. Birds/Day)	No. Birds	(Avg. Birds/Day)
Isley	29	(7.2)	52	(5.7)
Fisher 1	65	(21.7)	73	(9.1)
Fisher 2 (Control)	20	(6.7)	18	(2.0)
Eisenmann	13	(4.3)	50	(5.0)
Goetz	0	(0.0)	9	(0.8)
Brubaker (Control)	1	(0.3)	0	(0.0)

TABLE 4. A summary of grackle counts during the perimeter/transect census.

Field Site	Pre-Treatment		Post-Treatment	
	No. Birds	(Avg. Birds/Day)	No. Birds	(Avg. Birds/Day)
Isley	4	(1.0)	6	(0.7)
Fisher 1	0	(0.0)	4	(0.5)
Fisher 2 (Control)	0	(0.0)	5	(0.6)
Eisenmann	0	(0.0)	47	(4.7)
Goetz	2	(0.7)	47	(3.9)
Brubaker (Control)	5	(1.7)	35	(11.7)

Key To Maps

Territorial/Singing Males

□ Pre- □ Post ■ Both

Nesting Conditions

○ - Nest ◐ - Nest with eggs ● - Nest with young

Other Sightings

△ Pre- ▲ Post ▲ Both

Abbreviations

BL - Bobolinks
 BS - Barn Swallow
 FL - Flycatcher
 GR - Grackle
 HL - Horned Lark
 HS - House Sparrow
 IN - Indigo Bunting
 KD - Kildeer
 MD - Morning Dove
 RB - Robin
 RW - Redwing Blackbird
 SA - Savannah Sparrow
 SB - Shore Birds
 SS - Song Sparrow
 ST - Starling
 VS - Vesper Sparrow

Types of Fields

▣ Soybeans
 ▤ Oats
 ▥ Tomatoes
 ▦ Corn
 ▧ Wheat
 ▨ Potatoes
 ▩ Woodlot
 ▪ PIK
 ▫ Structure

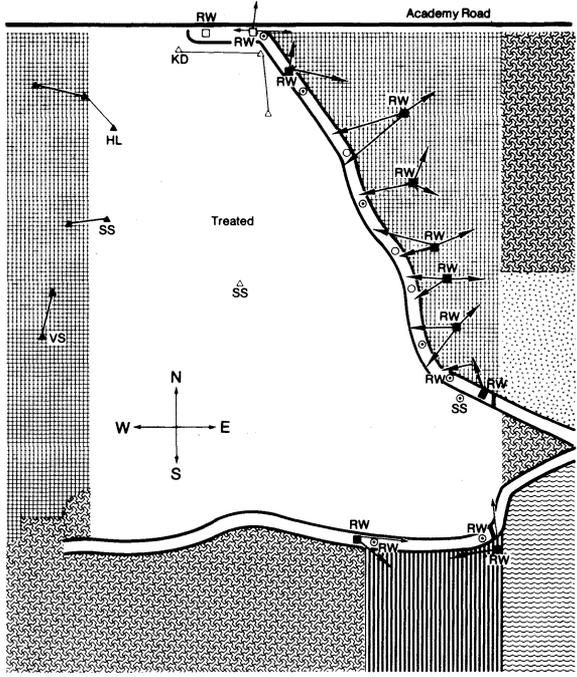


FIGURE 1. Isley Farm Plot

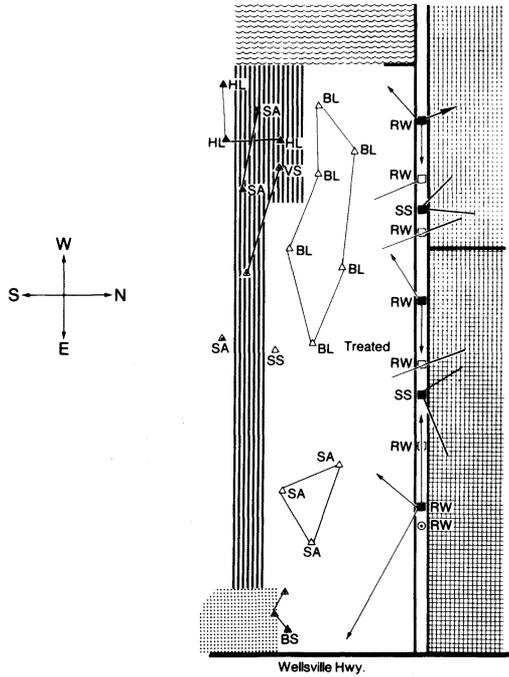


FIGURE 2. Fisher Farm Plot #1

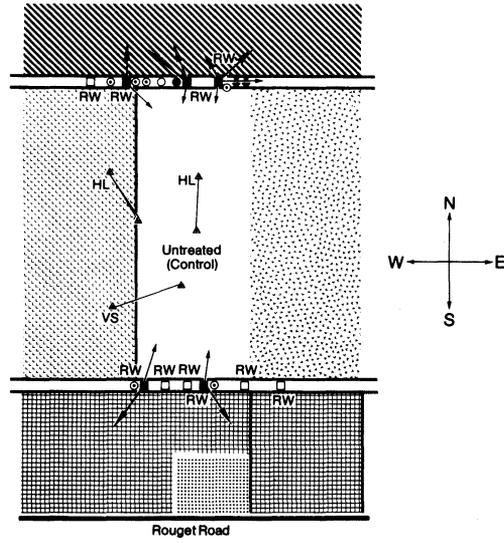


FIGURE 3. Fisher Farm Plot #2

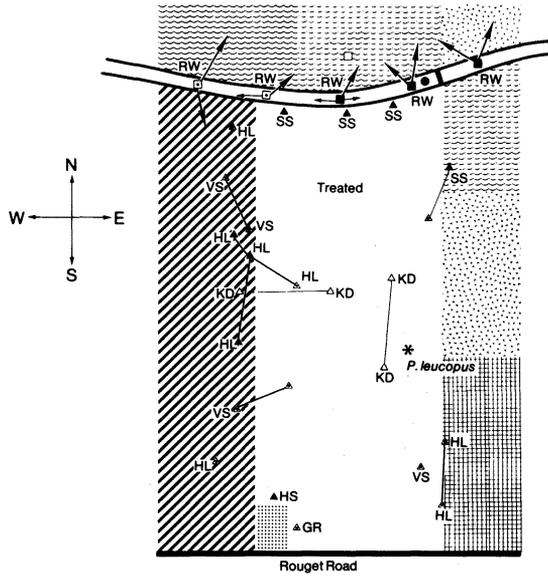


FIGURE 4. Eisenmann Farm Plot

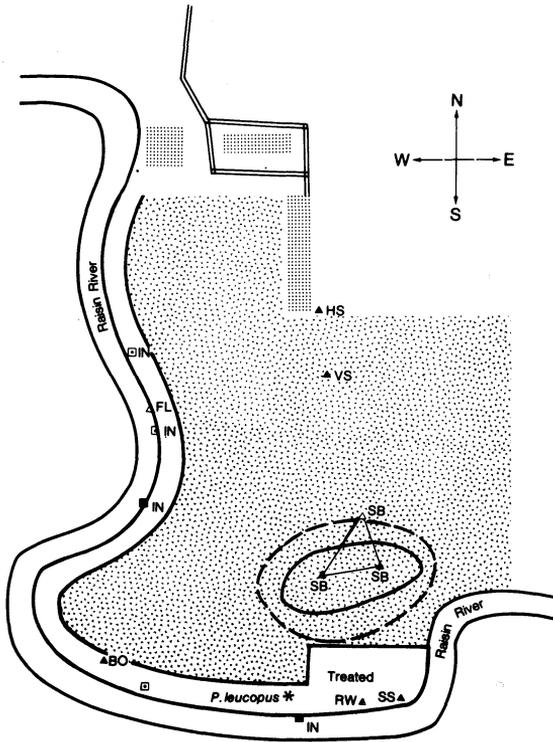


FIGURE 5. Goetz Farm Plot

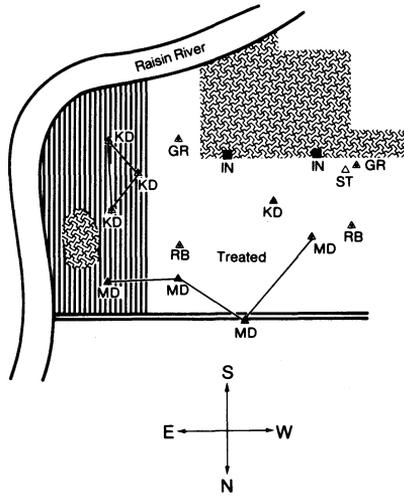


FIGURE 6. Brubaker Farm Plot