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ABSTRACT

This study examined the ability of pole-bound hawk-kites to protect maturing fields of corn from blackbird damage. Hawk-kites were placed over half of each experimental field. Damage on the hawk-kite side was slightly, but not significantly, less than on the unprotected side as measured by the percent of ears damaged by birds, total amount of grain lost to birds, or percent of crop damaged by birds. Bird damage on the hawk-kite side of the experimental fields also did not differ significantly from nearby control fields. Four different types of hawk-kites, which differed in size, design, and in the raptor species printed on them, were used in this study. None of them differed significantly in their ability to reduce bird damage. All of the pole-bound hawk-kites also required considerable labor to keep them in repair. Consequently, their use was not found to be cost-effective in these experiments.

INTRODUCTION

Red-winged blackbirds (*Agelaius phoeniceus*) and common grackles (*Quiscalus quiscula*) can cause extensive damage to ripening corn fields. In Ohio, Michigan, Kentucky, and Tennessee, for instance, single year losses were estimated at over $9,500,000 (Stickley et al., 1979) and $1,400,000 in Pennsylvania (Wakely and Mitchell, 1981). While these losses are less than 1% of the total corn crop in these states, the problem is still serious because bird damage is often concentrated at a small percentage of farms where losses are sometimes over 10% (Dolbeer, 1981).

One promising new method of alleviating bird damage to crops is the use of hawk-kites (Conover, 1979; Conover and Perito, 1982). These kites usually are flown 30 m aloft by suspending them beneath helium balloons. In a comparative study of different techniques to protect corn fields, Conover (1984) found that the placement of either a single propane exploder or hawk-kite in a small corn field reduced bird damage by 77% and 83% respectively.

In contrast, fields treated with 4-Aminopyridine (sold under the name Avitrol) did not significantly differ from unprotected fields. However, the hawk-kites were not as cost effective as the exploders because the former were more labor intensive, requiring some effort to keep them and their balloons in working order. In an attempt to minimize the labor and expense associated with the hawk-kites, I tested the feasibility of tethering the hawk-kite to the top of a long limber pole instead of to a helium balloon. In this experiment, I examined whether several pole-bound hawk-kites in a single field could protect maturing fields of corn from bird damage while reducing the labor costs.

METHODS

These experiments were conducted in 1982 and 1983 at the Tiffany dairy farm in Lyme, Connecticut and at the Lockwood farm in Hamden. At the Tiffany farm, fields ranged from 2 to 6 ha in size. Six fields were used in 1982 and four in 1983. Two fields (each 0.3 ha in size) at the Lockwood farm were used in both years. The hawk-kites were manufactured by K. G. Gunter Co. of West Germany and distributed in this country by Tiderider Inc., Baldwin, N.Y.

Four different types of hawk-kites were used in these experiments: Falke, Mausebussard, Steinalder, and Habicht (Fig. 1). These kites varied in both their design and in the raptor species they mimicked. In 1982, the top of the kites were tied directly to the limber tip of 5 m bamboo poles using a 1 to 4 cm leader. Problems developed with this method due to the kites tangling up with the pole. Consequently a different method was used to secure the kites in 1983. Two bamboo poles were erected 3 m apart at each kite station and a strong piece of braided nylon line was tightly strung between the two poles. This line contained a swivel near each end so the line would not get twisted. The kite was then tied to the middle of this line using a third swivel.

At each farm, fields were randomly assigned either to serve as an unprotected control field or as an experimental field which contained the hawk-kites. Each experimental field was also divided in half and the hawk-kites were placed in a regular fashion throughout one side, the other side was left unprotected as a second control. The side of the field to receive the hawk-kites was decided at random.

The hawk-kites were placed out when the corn was entering the milk stage and bird damage first began; they remained until the corn was cut for silage in early October. One or two of each hawk-kite type was used in each field (a total of four to eight kites per field).

Several dependent variables were used to measure the extent of bird damage in each field. During the course of the experiments, damage was measured weekly in the experimental fields by counting the number of ears damaged by birds among 100 consecutive ears along a single row. Four such rows were established within 40 m of each hawk-kite and similarly distributed in the unprotected side of these same fields. An ear was considered damaged if its husk was torn or shredded by birds. A Student's t-test for paired data was then conducted on the weekly mean percentage of ears damaged to assess for any significant differences between hawk-kite and control sides. A 2-way ANOVA and multiple range test were used to test for any significant differences among the types of hawk-kites. A record was also kept of how often the different types of hawk-kites became damaged or entangled during the season.

A final determination of bird damage in each field was made immediately before the corn was cut for silage. At least 200 ears were randomly selected from each field using a method described by Conover (1984). The total length of the ear that bore kernels was measured to the nearest cm as was the length of the ear which had been damaged by birds. A length/weight table (DeGrazio et al., 1969) which had been adapted for Connecticut corn (Conover, unpubl.) was used to estimate both the total weight of the grain on each ear in the absence of any bird damage and the weight of the grain which had been removed or damaged by birds.

These data were used to measure the percentage of the grain which had been damaged by birds. These data also were used to assess the total amount of grain produced per field (kg/ha) and the total amount per hectare lost to birds in each field. To determine these later two values, I estimated the number of ears per hectare for each field using a method described by Conover (1984). Significant differences in either the amount of grain damaged by birds or in the percent of the crop lost to birds were then determined using a Student's t-test for unpaired data. Similar statistical comparisons between the unprotected and the hawk-kite side of the experimental fields were made using a Student's t-test for paired data.

RESULTS

Throughout the entire test period, only slight differences in the proportion of ears damaged by birds between the hawk-kite side and the unprotected side of the experimental fields were recorded, none of which were statistically significant (Table 1). There also was little difference in the ability of the different hawk-kite models to reduce bird damage (Fig. 2). By the end of September, the percent of corn ears damaged by birds within 40 m of the Falke was slightly less than that around the other models. Differences among the hawk-kites, however, were never statistically significant ($F = 0.10$ for data collected on 16 September, $F = 0.17$ for 24 September data, and $F = 0.14$ for 30 September data).

TABLE 1. Percentage of corn ears damaged by birds on the hawk-kite side and the unprotected side of the seven experimental fields.

	% of ears damaged		Student's t-test
	Hawk-kite side	Unprotected side	
Sept. 16	8.9%	12.0%	1.23
Sept. 24	16.0%	16.4%	0.13
Sept. 30	21.4%	26.5%	1.08

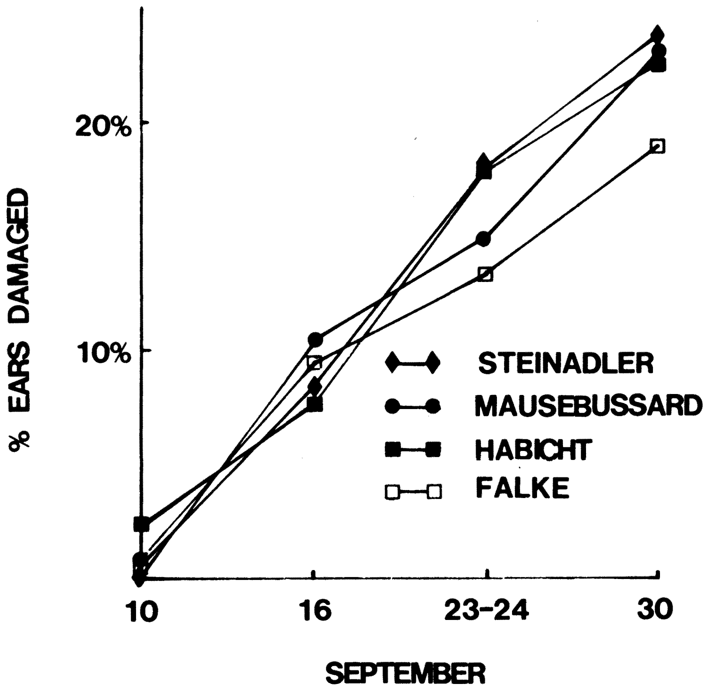

FIGURE 2. Mean percentage of corn ears damaged by birds within 40 m of the different hawk-kites.

One problem which I experienced in the hawk-kites was their vulnerability to being damaged or entangled with the poles supporting them. This problem was most severe with the Mausebussard and Steinadler. During the one month the kites were in operation in 1981, each of these kites had to be repaired an average of 3.9 times, while the Habicht was repaired 3.0 times and the Falke 2.0 times. Changes in support pole design in 1983 helped alleviate this problem. That year, no kites had to be repaired more than three times during the month-long test period.

By the time the corn was ready to be cut for silage, birds had damaged an average of 188.3 kg/ha of corn on the hawk-kite side of the experimental field and 253.0 kg/ha on the unprotected side. These differences, however, were not statistically significant ($t = 1.64$). These losses represented 2.0% of the total grain crop grown on the hawk-kite side of these fields and 3.1% of the grain from the unprotected side; again these differences were not statistically significant ($t = 1.71$). In the unprotected fields which served as controls, an average of 630 kg/ha of grain were lost to birds, a loss equal to 8.2% of the grain from these fields. Differences between these fields and the hawk-kite side of the experimental fields were not statistically significant for either dependent variable ($t = 1.62$ based on the amount of grain loss and $t = 1.50$ based on the percent of the crop loss).

DISCUSSION

The results of this experiment were generally disappointing. While the amount of bird damage in areas containing the hawk-kites was 26% lower than in the unprotected parts of the same field and 70% lower than in untreated fields, these differences were not statistically significant. The hawk-kites in this experiment afforded considerably less protection than they had in an earlier study (Conover, 1984) where the hawk-kites were suspended beneath helium balloons. In the present study, the kites were tethered to poles, a technique which had two major drawbacks: the hawk-kite's mobility was greatly reduced and the kites often became damaged or entangled in the poles. Because of this latter problem, about 25% of the kites were nonfunctional at any one time in 1982 despite considerable efforts to keep them in repair. Although changes made in 1983 greatly alleviated this problem, the hawk-kites still were not very effective in reducing bird damage.

The main problem with the pole-bound hawk-kites was that their mobility was much lower than when they were flown from balloons. In the latter case, a hawk-kite could move in any direction on its 40 m tether but when tied to a pole its mobility was restricted to only about 2 m.

Use of pole-bound hawk-kites was not cost-effective in these tests even when we assume that the hawk-kites were actually responsible for the 452 kg/ha difference in mean bird damage between the control fields and the hawk-kite side of the experimental fields. This damage represents a loss of $100/ha when corn is selling for $0.22/kg. If four hawk-kites are used per ha, the cost for materials to use the kites comes to $36/ha (kites, poles and stakes), assuming that half of the kites and poles will have to be replaced during the season. If we assume labor costs of $4/hr and that 3 hr of labor are required to set up, take down, and keep in repair each kite, the total cost to use the hawk-kites is $84/ha, not substantially lower than potential maximum benefit of $100/ha. Hence, based on the results of this experiment, the use of pole-bound hawk-kites does not seem worthwhile.

DISCUSSION

Question: How much of the variability can be accounted for by your hawk-kite mortality?

Conover: There were 4-8 hawk-kites/per field. So even when we had 50% mortality, there would still be two or four kites left in each field.

Laidlaw: Can the birds learn that the small kite is no longer a threat and transfer that learning experience over to the big kite?

Conover: That could very well be. Mobility is crucial. When the kite is floating over a field, it looks very much like a soaring hawk, but when it's tied to a pole and its movement is restricted to a few meters it doesn't take a red-winged blackbird very long to learn that there's something wrong with that hawk.

Question: What would you recommend to a farmer? Exploders rather than hawk-kites?

Conover: Both cannons and kites reduce bird damage significantly in our tests, but the propane cannons were more cost effective.

In Connectitut we also have a state law that no cannons could be used within 500 feet of a house. Thus propane cannons cannot be legally used in many of our fields.

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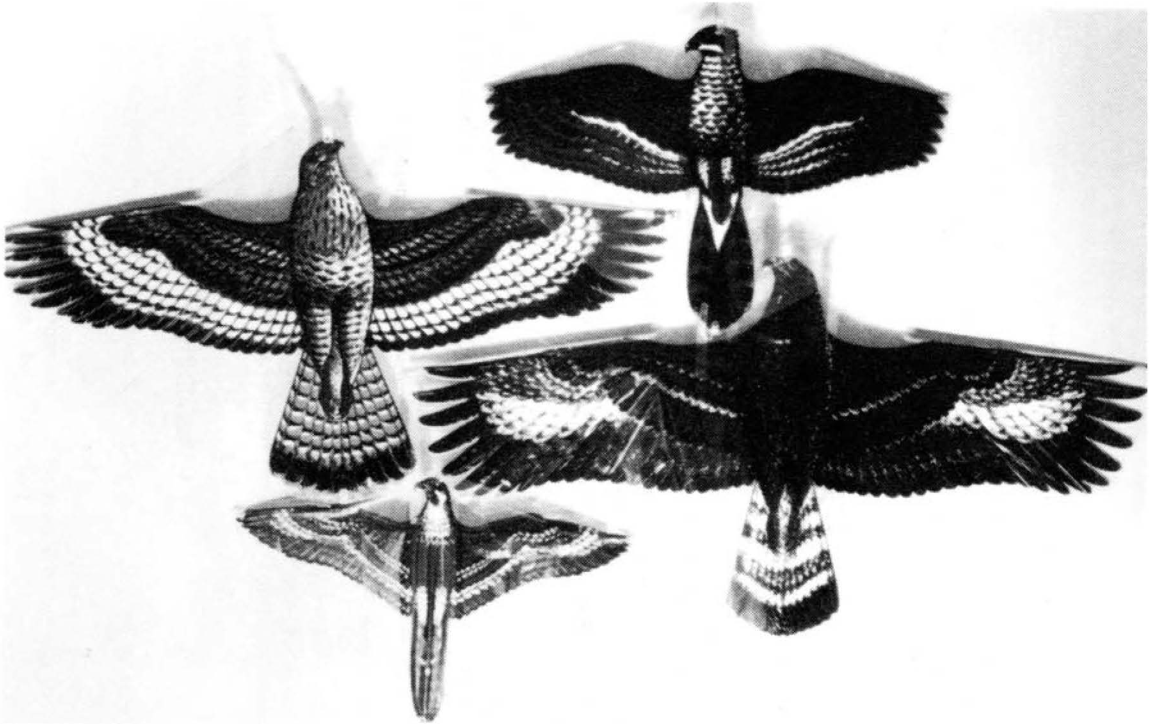

FIGURE 1. The four different types of hawk-kites used in this study: Mausebussard (upper left), Habicht (upper right), Falke (lower left) and Steinalder (lower right).