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REDUCING BLACKBIRD DAMAGE TO NEWLY PLANTED RICE WITH A NONTOXIC CLAY-BASED SEED COATING

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ABSTRACT: At 3 sites in Chambers County, Texas, the estimated sprout loss in 1-ac plots sown with clay-coated rice seed averaged 17.0% compared to 36.5% in adjacent 1-ac control plots. In one field, bird use of the control plot was 14 times that of the treated plot. Average feeding rates of red-winged blackbirds (Agelaius phoeniceus) were 1.5 seeds/min and 8.4 seeds/min in the treated and control plots, respectively. Roadside counts of territorial male redwings and evening flightline counts of birds going to roost indicated a depredating population consisting mainly of nonbreeding, roosting birds early in April with increasing proportions of breeding birds as the rice-planting season progressed. The results of this study are consistent with previous laboratory findings and with predictions from foraging theory. Further development and field testing of the seed coating will be required before the technique becomes generally available as a method for reducing bird damage to sprouted rice.

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INTRODUCTION

Bird damage to newly planted rice is a serious problem for many growers in eastern Texas (Appendix I) and southwestern Louisiana. Even though an apparently effective chemical repellent, methiocarb, exists (Holler et al. 1985), it is unavailable to growers because it is not EPA-registered. Lethal control methods are under investigation (Glahn et al. 1988, Glahn et al. 1989) but have not yet been proven effective.

An alternative to lethal techniques and to chemical repellents is a bird-resistant, nontoxic seed coating that has proven effective in cage and small enclosure trials (Daneke and Decker 1988). The coated rice becomes sticky when wet and fouls the birds' bills so that they cannot feed efficiently. As a result, they switch to more easily eaten alternate foods. In 1988, a small-scale field trial in Louisiana did not successfully test this concept because the formulated coating did not adhere to the rice seed. This problem in the formulation was remedied and a field trial was conducted in east Texas to examine the efficacy of the new formulation in reducing bird damage in an area of traditionally high bird losses.

We appreciate the cooperation of rice producers C. Fancher, G. Nelson, and M. and B. Schultz. Thanks to G. Wallace for field assistance and J. Glahn for comments on the manuscript.

METHODS

Study sites were selected based upon growers' apparent willingness to cooperate and the expectations of bird damage. Each site consisted of two 1-ac (0.4 ha) plots one of which was randomly selected to receive coated rice. Site preparation was conducted by the growers according to local practices. One site (Fancher) was dry-seeded; the others were water-seeded. Seeding of the treatment and control plots was done by the investigators. Planting dates ranged from 13 to 19 April. Seeds were broadcast by hand-operated centrifugal seeders calibrated to deliver approximately 100 pounds per acre (113 kg/ha). Treated rice was prepared in 5-kg batches at the Florida Field Station, and coated rice was tested at Gainesville for germination and adherence of coating following methods described by Daneke and Decker (1988).

Prior to seeding, 20 sampling quadrats (0.19 m^2) were located in each test and control plot. Sampling transects were located perpendicular to the long axis of each plot at 5 randomly selected points. Transects were at least 5 m apart. The total length of the transects was divided by the number of sampling points (20) to determine the distance between the pairs of sampling quadrats. A random number between 1 and this inter-quadrat distance specified the location of the initial sampling point on the first transect. Subsequent sampling points were separated by the predetermined inter-quadrat distance, with distance counts carrying over from one transect to the next. Quadrats on the sampling transect were protected by 60 × 60 × 20-cm bird-proof exclosures made of 2.5 × 5.0-cm mesh wire. At a randomly selected bearing, 1.8 m from each exclosure, an unprotected quadrat was located. Counts of sprouts from the pairs of protected and exposed quadrats provided data on which evaluations of treatment effectiveness were made. Sprouts in sampling quadrats were counted on 11 May when the threat of bird damage had passed. Analysis of sprout count data followed procedures of Holler et al. (1982).

From 20 to 23 April, bird activity at the Nelson site was monitored for 1.5-2 h during the periods 0800-1000 and 1630-1830. Individual birds were observed through a 25X spotting scope to determine feeding rates on treated and untreated seeds. Focal individuals were selected haphazardly and the number of seeds eaten by an individual was recorded until that bird left the plot or for 60 sec, whichever was less. An index to total bird use of the control and treated plots was obtained by counting the number of birds present on each plot at 10-min intervals and then summing over the observation period.

On 2 April, blackbird flocks encountered during the day were followed in late afternoon as they left their feeding areas and presumably headed toward a roost site. Each flock followed went east in the direction of an extensive complex of marshes southeast of Winnie. On 8 subsequent evenings, blackbird flocks were counted for 1 h from a vantage point 1.6 km (1 mi) east of Route 124 as they passed heading east and southeast toward the extensive wetland area. These counts provided an index of the temporal change in the roosting activity of the local blackbird population.

On 8 occasions, from 4 to 24 April, solitary, territorial male red-winged blackbirds were recorded along a 16-km (10-mi) road survey route. Counts were made from a slow-moving vehicle and included single male redwings perched in vegetation or flying short distances within 50 m of the road. The route passed beside rice fields and pasture and was continuously bordered by roadside ditches, canals, and brushy field edges.

RESULTS

Sprout counts showed that losses at the Fancher and Schultz sites were considerably greater in the control plots than in the treated areas, but at the Nelson site, sprout loss estimates were virtually identical in the 2 plots (Table 1). Overall, control plots lost an estimated 36.5% of their sprouts compared to 17.0% in the treatment plots. However, overall there was no statistical difference between treatment and control ($P < 0.4$, $t = 1.24$, 2 df). Expected sprout numbers, based on counts within the exclosures, were very similar among sites for the treatment plots. However, expected sprout estimates varied considerably among the control plots. There is no apparent explanation for the variation in the control plot estimates.

At the Nelson site, over 14 times as many redwings and grackles (Quiscalus sp.) were observed in the control plot as were seen in the treated plot (Table 2). Virtually all of the treated plot use occurred during the first morning following draining of the field, when the seeds were initially exposed. Redwings were the dominant species at the site, but grackles were also numerous. In addition, 4 to 8 yellow-headed blackbirds (Xanthocephalus xanthocephalus) were present at least through 23 April. Redwings and grackles fed on sprouted rice at similar rates. The limited observations of birds feeding on treated seed suggest a substantially reduced feeding rate (Table 2).

Observations of birds in control and treatment plots were obtained only at the Nelson site because bird activity at the other 2 sites was minimal when we were present.

Counts of territorial male redwings remained fairly constant in early April but increased dramatically to over 200 birds per 16 km after 12 April (Fig. 1). Conversely, the evening counts of blackbird flocks going to roost declined steadily after peaking on 15 April.

DISCUSSION

We recorded a rather abrupt shift in redwing behavior in mid-April (Fig. 1). Before then, roosting activity was relatively high, as indicated by evening flightline counts, and territorial males were relatively few. After 15 April, the reverse was true as flightline counts declined steadily and roadside counts of males doubled. Thus, growers early in the season were confronted with a blackbird population of mostly nonbreeding, roosting birds, whereas later in April the depredating population had a relatively greater component of breeding birds. Besser and Eastin (1979) conducted roadside counts of territorial male redwings during mid-April in the same general area of Chambers County and recorded about 10 birds per mile, similar to our results prior to 15 April. They did not record numbers approaching our later surveys, however.

The shifting composition of the depredating bird population should be factored into damage reduction strategies for newly seeded rice. It is possible that roost-centered control techniques would be efficacious early in the season but rice planted in late April would be best protected by techniques that target nearby breeding birds. The possibility for damage control through roost management cannot be ruled out, but the prospects do not seem promising. Roost habitat is virtually unlimited in the area. Our observations and others (Besser and Eastin 1979) suggest that there is a sizable roost in the extensive wetlands southeast of Winnie, but there is no road access and the exact location of the roost is unknown. In addition, we observed birds flying into the Anahuac National Wildlife Refuge to roost, and in previous years, roosts have been identified in wetlands just west of Anahuac (Besser and Eastin 1979). Thus, there is no single roost that serves as a source of depredating blackbirds, and we did not observe any pre-roosting assembly staging areas. The situation in Chambers County is probably not unique, but rather it is likely to typify the entire coastal rice-growing area of Texas and Louisiana. A field-centered approach to bird damage control that directly affects the birds at the site may hold more promise than a roost-centered strategy.

Table 1. Expected numbers of rice sprouts and estimated sprout loss to birds at 3 study sites near Anahuac, Texas, April 1989.

	Expected number of sprouts (1000's) (1 ac)		Estimated number lost (1000's ± SE) (1 ac)		Sprout loss (% + SE)	
Site	Treated	Control	Treated	Control	Treated	Control
Fancher	742	458	89 ± 59	117 ± 71	12.1 ± 8.1	25.6 ± 15.5
Nelson	806	805	196 ± 88	208 ± 94	24.3 ± 10.8	25.8 ± 11.6
Schultz	644	1,474	95 ± 89	858 ± 256	14.7 ± 13.9	58.2 ± 17.4

Table 2. Red-winged blackbird and grackle (Quiscalus sp.) use of 1-ac treated and control plots at the Nelson site near Anahuac, Texas, 1989.

Observation period	Number of counts	Total count during observation period: Treated RW	Treated GR	Control RW	Control GR	Seeds eaten/min and number of birds observed ()[a]: Treated RW	Treated GR	Control RW	Control GR
20 April									
0900-1030	9	16	25	58	37	not recorded		not recorded	
1700-1830	7	1	0	45	26	not recorded		not recorded	
21 April									
0800-0930	9	4	0	214	19	2(2)	--	9.7(9)	12.0(2)
1700-1830	9	1	1	39	3	--	0(1)	10.0(8)	8.5(2)
22 April									
0830-1000	10	2	1	76	2	5(1)	6(1)	9.1(14)	--
1630-1830	12	0	1	74	17	0(3)	3(1)	8.9(16)	9.6(5)
23 April									
0800-1000	12	0	0	54	8	--	--	5.9(16)	8.0(4)
1700-1830	9	0	0	61	17	--	--	8.1(12)	5.5(4)
Total	77	24	28	621	119	1.5(6)	3(3)	8.4(75)	8.4(17)

[a]a dash (--) indicates that no birds were observed feeding in the plot.

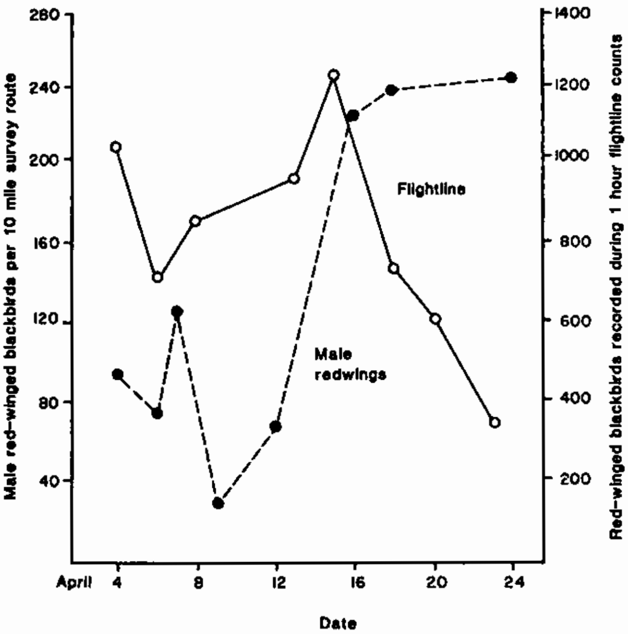

Fig. 1. Roadside counts of male red-winged blackbirds along a 10-mi survey route and numbers of blackbirds recorded during 1-h flightline counts throughout April 1989 near Anahuac, Texas.

Despite what was considered by local rice growers to be a relatively light year for blackbirds, each of the 3 test sites in this study suffered substantial losses. The coated rice seed appeared to reduce losses at 2 sites. At the third site, damage assessment did not reveal any effect of the treatment, but observations showed that the treated plot received roughly 14 times less bird use than did the control. The failure of the damage assessment to corroborate the bird observations may be due to a nonuniform seed application, the vagaries of the sampling scheme, or a gradual loss of effectiveness of the clay coating. If the coating did dissipate over time, then damage could have increased sometime after the observations ceased and before the sprout counts were made. However, cursory inspections revealed no evidence that the coating failed to persist throughout the period of damage susceptibility.

The feeding observations at the Nelson site revealed several important points. The birds tended to forage along the edges and only infrequently used the interior of the plots. In the future, damage assessment procedures may have to be modified to account for this. The birds also concentrated their feeding activity in the wet areas of the field where drainage was incomplete and where seeds were easier to remove from the mud. The activity recorded in the treated plot (Table 2) indicates the birds learned quickly to avoid the coated rice and to use the untreated plot instead. The birds required considerably longer to handle and eat a coated seed than an uncoated one (Table 2). This corroborates previous findings in cage studies where there was almost a 6-fold difference between feeding rates with coated and uncoated seeds (Daneke and Decker 1988). The field observations are consistent with the original premise that if a normally preferred food is made sufficiently difficult to locate or to process, then birds will move to forage elsewhere on food that is easier to handle. These results are encouraging, but it remains to be seen what the response will be to large acreages planted with coated rice seed. Additionally, the economics of coating and applying the seed have to be addressed. To date, we have not been constrained by cost, but in order to experiment with whole-field treatments and to make the technique generally available, it will be necessary to develop a less costly and less bulky coating procedure.

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Appendix I. ESTIMATED ECONOMIC IMPACT OF BLACKBIRD DAMAGE TO NEWLY PLANTED RICE IN EAST TEXAS.

The following estimates were derived by one of us (M.O.W.) in cooperation with Dr. Arlen Klosterboer, Extension Agronomist, and Dr. Fred Turner, Plant Nutritionist, both with the Texas A&M University Agricultural Research and Extension Center, Beaumont, Texas. Flying costs were obtained from M&M Air Service, Jefferson County, Texas.

About 300,000 acres of rice are planted in Texas. Conservatively, 15% (45,000 acres) are affected by blackbirds pulling sprouts. When an area damaged by blackbirds is reseeded, several costs are incurred:

(1) To reseed one acre with 75 lb of seed: $4.85 flying cost
16.00 seed
$20.85

(2) Indirect costs are also incurred. Additional applications of fertilizer and herbicide are required to offset the longer growing season caused by reseeding. Thus,
Extra herbicide application $10.50
(3 lb ai/ac) - per acre basis 4.85 flying cost
$15.35

(3) Additional water for an extra flush - per acre basis $20.00

Taking into consideration the above information (1, 2, and 3), reseeding could cost producers about $50/acre.

Fields that are damaged but not reseeded still incur increased production costs. Bird damage results in less dense stands of rice that favor weed establishment and necessitates increased herbicide use. Sparse stands also favor increased numbers of insect pests (particularly rice water weevils) that require additional insecticide applications. Furthermore, a stand that is damaged by birds is likely to mature asynchronously, thus increasing drying costs after harvest.

Information obtained from seed applicators in east Texas suggests that approximately one-third of the 45,000 affected acres (15,000 acres) is reseeded. Assuming the remaining affected acres incur increased production costs of $25/acre, then the yearly production costs due to blackbird depredation on sprouting rice in Texas is:

$50/ac × 15,000 ac =	$ 750,000
$25/ac × 30,000 ac =	750,000
	$1,500,000

In addition, there are costs due to reduced yield and quality. For instance, bird damage can cause nonuniformity in crop at harvest time which is reflected in reduced milling yields. Reseeding can reduce yields if it takes place after the optimum planting window. In addition, late seeding can negate ratoon crop production or delay ratoon harvest when wintering blackbirds and inclement weather become limiting factors.

If yield and quality losses on 45,000 acres are conservatively estimated to be 10% per hundred weight (cwt), then these losses would total $2.7 million (assuming an average yield of 60 cwt/ac and an average price of $10/cwt). Thus, a very rough estimate of total yearly damage by blackbirds (minus control costs) on sprouting rice in Texas is $4.2 million. Now, if control costs of $10 per acre (for guns and rifles, ammunition, labor, scare cannons, etc.) are incurred on one half of the affected areas, this adds another $225,000 which brings the grand total to about $4.4 million.

The above estimates are best guesses based on field observations and personal experience. Clearly, research into the economic impact of blackbirds is needed throughout the rice-producing region.