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Responses of blackbirds to aerial application of Flight Control bird repellent to ratoon rice in Cameron Parish, Louisiana

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Blackbird damage to ripening rice is an economically important problem for many producers in Louisiana and elsewhere. Currently, management options for dealing with this problem are limited and generally ineffective. One possible option is the application of a chemical feeding deterrent. In October 1998, we tested the commercial bird repellent Flight Control, which has anthraquinone as its active repellent ingredient. Blackbird use of a 4-ha plot of ratoon rice treated with Flight Control at a rate of 18.7 L ha^{-1} declined dramatically and birds stayed off the plot for 7 d postspray. These results corroborate those obtained in a similar trial in 1997 and suggest that Flight Control can be an effective component of blackbird damage reduction strategies in ripening rice.

Red-winged blackbirds (*Agelaius phoeniceus*) and related species cause millions of dollars of damage to rice annually in southeastern United States (Wilson et al 1989, Decker et al 1990). While recent research efforts to alleviate this problem have focused on the newly planted crop (e.g., Holler et al 1982, Wilson et al 1989, Decker et al 1990), losses to the ripening crop are considerable. Although the level of damage has not been measured, estimated losses in Texas alone exceed $8 million annually (M.O. Way, Texas A&M University, Beaumont, Texas, personal communication). Furthermore, blackbirds also damage wild rice, a valuable and rapidly growing crop in northern California (Gorenzel et al 1986).

When confronted with blackbird damage to ripening rice, rice producers have few options. Recommended practices include harassment with various scare devices and noisemakers and shooting (Dolbeer 1994). Chemical feeding deterrents constitute another set of potential blackbird management options, but as yet no compound is registered for use in ripening rice.

For blackbird control in ripening rice, a chemical repellent must be cost-effective and environmentally benign. The latter is particularly important because rice is grown in water and toxicity to aquatic organisms is often a major concern. One candidate compound that appears to meet these criteria is Flight Control™, a product developed by Environmental Biocontrol International (EBI), Wilmington, Delaware. This product contains 50% anthraquinone as the active ingredient. Anthraquinone is an effective blackbird repellent when applied to rice seed (Avery et al 1997, 1998), and Flight Control is registered for use as a bird repellent on turf.

In a preliminary trial conducted during October 1997, Flight Control applied at 18.7 L ha^{-1} discouraged bird use of a 4-ha plot of ratoon rice for several days (M.L. Avery, unpublished data). On the basis of that result, we felt that further evaluation of Flight Control was warranted to determine blackbird responses to treatment on ripening ratoon rice, to document residues on rice grains, and to establish relationships between application rate and residue of the seed.

Methods

The test site in Cameron Parish, Louisiana, was selected because of consistent bird pressure (approximately 500–1,500 blackbirds) on the site. The 28-ha field that we used had been harvested using a stripper-header combine and was approximately 8 km from the nearest field of ripening rice. In the part of the field where we observed the most bird activity, we delineated two 201 × 201-m plots separated by a 31 × 201-m buffer. We selected the west plot for treatment because of its higher use by birds. There appeared to be a roost established beyond the field to the west as birds usually arrived from and departed in that direction. From 1 d before treatment to 7 d posttreatment, we observed the plots twice daily (between 0700–1000 and 1500–1800) for 2 h. We monitored bird activity within the test site and recorded the total number of birds in each plot at 5-min intervals.

The treatment was applied late in the morning on 15 October 1998. The sky was clear with a light wind from the east. The application consisted of 76 L of EBI Flight Control, 3.8 L of Latron CS-7 (Rohm and Haas, Philadelphia, Pennsylvania) sticker, and 299 L of water. The treatment was applied aerially at 93 L ha^{-1}. The aircraft used 33 number 12 Lund nozzles, which covered a 15.3-m swath.

We established four north-south transects within the treated plot and randomly located two sampling points on each transect. At each sampling point, we clipped five rice panicles 1 d before treatment and 1 h and 1, 3, 7, and 14 d posttreatment. The clipped panicles were stored in an air-conditioned room and seeds from these panicles were subsequently sent to EBI for determination of anthraquinone residues. Differences among sampling dates were assessed in a one-way analysis of variance.

Results

On the morning just before treatment, we recorded an average of 177 blackbirds per 5-min interval in the west plot, more than three times the number we recorded in the east plot (50 $interval^{-1}$). Bird pressure increased in the afternoon following treatment of the west plot, with 223 and 123 red-winged blackbirds recorded per interval in the treated and control plots, respectively. Thereafter, bird use of the treated plot steadily declined and no birds used the plot after day 2 posttreatment (Fig. 1). Bird numbers in the control plot also declined after the second posttreatment day, and for the next 2 d almost all bird activity shifted to the east end of the rice field beyond the boundary of the control plot. Activity in the control plot resumed in the final 3 d of observation. Boat-tailed grackles (*Quiscalus major*), which had previously occurred in negligible numbers, became a larger constituent of the feeding flocks (up to 50% at times).

Although birds were recorded in the treated plot for 2 d following treatment, their behavior during those sporadic visits was noticeably different from that during pretreatment. The birds spent less time feeding and more time restlessly moving about. The rate at which the flock drifted and "leapfrogged" through the plot seemed to increase and birds departed the plot relatively quickly (after approximately 20 min) for no apparent reason. In the untreated plot and beyond to the east, flocks fed for extended periods of time, moved more slowly, and often relocated only when persistently harassed by raptors.

Anthraquinone residues averaged 337 ppm (SE = 43 ppm) immediately after application of Flight Control and declined to 209 ppm (SE = 39 ppm) 14 d posttreatment (Fig. 2). Only the 1-h and 14-d residues were statistically distinct ($F_{1,14} = 1.46$, $P = 0.044$). Residues varied considerably among the eight sample locations; samples 1 and 2 were consistently much greater than samples 7 and 8 (Fig. 3).

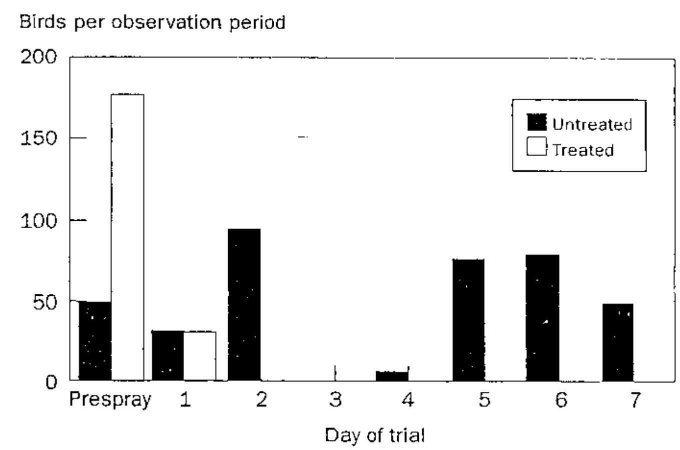

Fig. 1. Blackbird activity during 700–1000 at two 4-ha study plots in ratoon rice, Cameron Parish, Louisiana. The treated plot received one application of Flight Control bird repellent (18.7 L ha^{-1}).

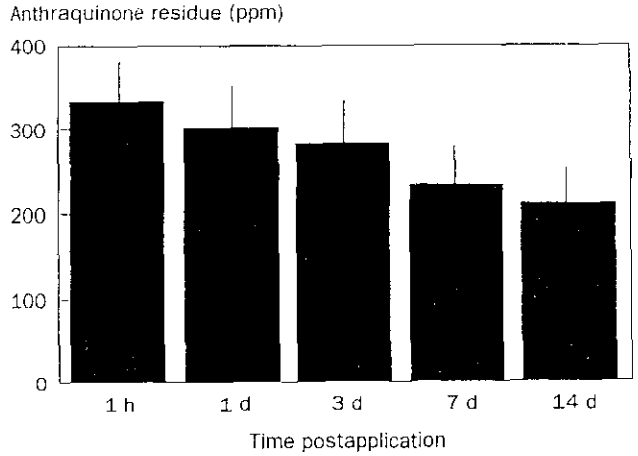

Fig. 2. Anthraquinone residues on rice seed collected from a 4-ha plot treated with Flight Control bird repellent (18.7 L ha^{-1}), Cameron Parish, Louisiana. Vertical bars denote 1 standard error.

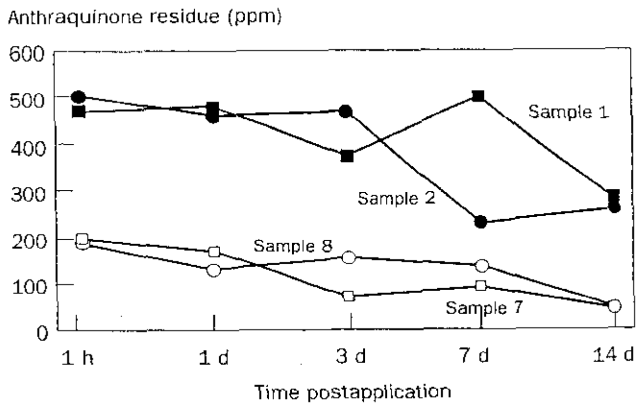

Fig. 3. Variation in anthraquinone residues on ripe rice seed obtained from sampling points throughout a 4-ha study plot treated with Flight Control bird repellent (18.7 L ha^{-1}), Cameron Parish, Louisiana.

We recorded 2.5–5.0 mm of precipitation on four of the seven days following Flight Control application. Total rainfall during this period was 14 mm.

Discussion

Application of Flight Control resulted in an 80% decline in use of the treated plot within the first 24 h and abandonment of the plot after 2 d. Interestingly, a corresponding decline in the use of the control plot also occurred as the birds shifted from

the test plots at the west end of the 28-ha study site to the eastern end. When blackbird flocks did return to the control plot, they stayed almost exclusively on the eastern end of the plot, several hundred feet from the treated plot. Possibly, this behavior was due to the birds' inability to distinguish reliably the boundary between the treated and untreated rice.

Conceivably, the observed response was a consequence of the birds' feeding method. Flocks of foraging blackbirds advance in a leapfrog-type movement, often at a pace of 3–6 m min^{-1}. It follows then that a strip pattern of application may be just as effective as complete field coverage. For example, perhaps the same 18.7 L ha^{-1} application rate could be used, but with 5–6 m between swaths, without a loss of effectiveness. If so, then the economic viability of Flight Control would be enhanced.

When we applied Flight Control to a 4-ha study plot in October 1997, we obtained a result similar to that in this trial. Although the 1997 trial was not monitored as closely as in 1998, postapplication visits to the study site revealed little or no bird activity where there had been thousands of blackbirds and grackles present before treatment with Flight Control. Anthraquinone residues from the 1997 study were greater than those obtained in 1998, however (Fig. 4). Although the application rate and general procedures did not change between years, this discrepancy may be due to differences in weather conditions or aircraft spraying systems. Given that both years produced effective blackbird control, the consistent results suggest that aerial application of Flight Control is robust over different sets of conditions.

To date, testing of Flight Control in ripening rice has been limited to two 4-ha ratoon crop sites. The results have been encouraging but considerable additional information is needed. Trials need to be conducted in a variety of rice-growing areas. Further testing should be conducted at different rates and patterns of application to determine cost-effectiveness and to establish a relationship between application rate

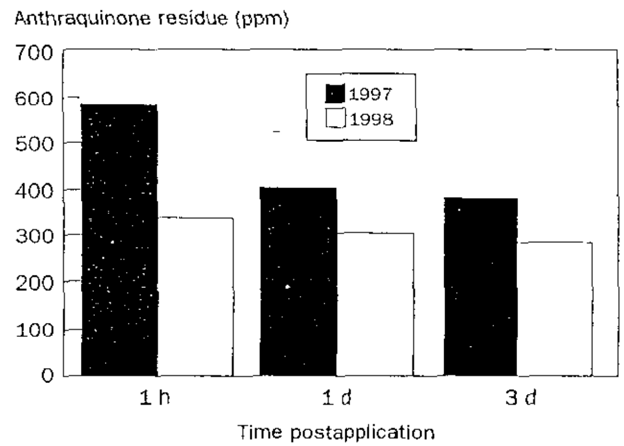

Fig. 4. Anthraquinone residues on ripe rice seeds from test plots in 1997 and 1998 that received applications of Flight Control bird repellent (18.7 L ha^{-1}).

and residue on the rice panicle and on the processed grain. In addition, it will be important to know the duration of adequate repellency. The trials to date have shown effective protection from depredation for at least 7 d postapplication, but such assessments need to be extended to 2–3 wk at least.

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Notes

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