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Kenneth E. Ballinger Jr.
DCV, Wilmington DE

Michael K. Gilmore
DCV, Wilmington DE

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DCV, Wilmington DE

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Kenneth E. Ballinger, Jr.
Life Sciences Division
DCV, 3521 Silverside Rd., Wilmington DE 19810

Michael K. Gilmore
Life Sciences Division
DCV, 3521 Silverside Rd., Wilmington DE 19810

Rebecca W. Price
Life Sciences Division
DCV, 3521 Silverside Rd., Wilmington DE 19810

Abstract

Birds found at or near airport flight operations pose a threat to aircraft. There were 2843 reported bird strikes in the United States in 1997 and 837 reported bird strikes in Canada for the year 1998. Potential for loss of life and economic losses due to aircraft damage have driven the need for research into effective techniques in lowering the risk of bird strike in the immediate area of flight operations. Flight Control™ is a documented bird repellent. Flight Control™ was released commercially in January 1999 in the United States for use on turf, ornamental trees and bushes, building surfaces and roof structures. Full scale testing was performed with the cooperation of Reagan National Reagan Airport in Washington, D.C., from September 1998 through the end of December 1998. Ground maintenance personnel from the airport applied Flight Control™ and USDA Wildlife Services employees made bird surveys. A reduction in certain birds was observed where Flight Control™ was applied. During the three months of the trial, a total reduction of 82% was recorded for five abundant bird species on the grassy surfaces that were treated. Total bird count at the airport remained unchanged during the period. Shifting of bird populations away from treated areas was observed.

Key words: anthraquinone, Flight Control™, bird repellent, Reagan National Airport, bird strike, bird strike risk profile.

A 7 year study was published in September of 1998 by the FAA Office of Airport Safety and Standards.(E.C.Cleary, S.A.Wright and R.A.Dolbeer, Wildlife Strikes to Civil Aircraft in the United States 1991-1997). The authors conclude the losses due to bird strike may amount to around $300,000 per year in downtime and actual equipment damage. The problems caused by bird strikes have been well documented and studied for decades. A generally accepted approach for bird control at airports has been adopted over the years. Three components of the program include:

1. Preparation of an airport specific bird survey by a qualified wildlife biologist. Private and government based wildlife organizations exist for this purpose and offer their services on a contractual basis. The survey is species specific by types of cover, time of day and by time of year.
2. Implementation of a combined treatment strategy by a bird strike hazard team located at the airport that includes site modification, harassment and observation of critical areas as determined in the bird survey. Logs of bird movement, concentrations and types of cover by species by time of day and time of year allow for a constant measure of performance.
3. Constant reevaluation of the bird strike hazards and the appropriate strategies occur when steps one and two are in place. New habitat, food sources and resulting wildlife pressures require an alert and flexible program.

EBI has developed Flight Control™ to harass birds away from food sources. Flight Control™ is presented in this paper to the wildlife management community concerned with bird strike with the hope of application advice. How does this tool provide assistance or is it a commercial turf product that has limited application at airports?

Flight Control™ is Anthraquinone.

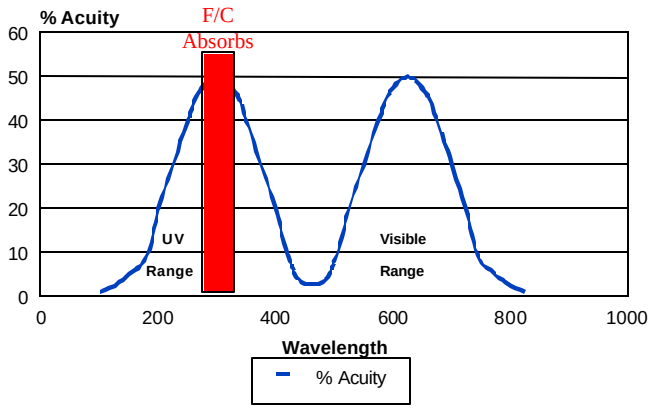
Anthraquinone is light tan in color, is naturally occurring and has no appreciable solubility in water. Fine crystals of the compound remain bound to the surface after the water carrier has evaporated. The half-life of Flight Control™ in soil has been measured at 28 days. This long persistence but eventual biodegradation allows for an extended treatment effect, depending on the loss of compound to physical removal. Flight Control™ is mixed with water and sprayed onto surfaces such as turf, ornamental bushes, non-food plant surfaces, buildings and ledges. Flight Control™ is stable in sunlight and in ambient temperatures. There is no appreciable volatility so there is very little loss to evaporation and has no odor.

How does Flight ControlÔ work?

Our current understanding of how Flight Control™ works is based on work done at the University of Pittsburgh by Dr. Melvin Kreithen and on studies performed by the USDA at Sandusky Ohio by Dr. Richard Dolbeer. We believe birds see Flight Control™ in the UV range since the compound absorbs in the middle of the visual acuity range.

Flight Control™ is not a trigeminal irritant but rather seems to be a post ingestional irritant. We are confident that the compound is non toxic to birds (1). Behavior studies show Canada Geese sampling the compound and a short time later, they tend to shake their heads and head for water to wash off the compound. Similar behavior was observed in gulls and pigeons. We believe the combination of a visual signal and a post ingestional irritant causes rapid learned response in birds. Flocks of Red winged blackbirds, Ring bill gulls and Canada geese seem to transfer the learned response to other individuals in the flock by some mechanism. More research on this activity will need to be performed before we can confirm these observations.

Visual Acuity of Birds



51% visual acuity is in the UV range

Summary of selected Flight Control™ Research

Laboratory, Pen and Field Studies With Bird Repellent, 9,10-Anthraquinone
Genesis Laboratories, Inc.
May 1997

Study Objective

Examine the efficacy of 9,10-Anthraquinone (AQ) against target species as an avian repellent.

Study Description

Laboratory studies were conducted by Genesis Laboratories at their facility near Wellington, CO. Wild European Starlings were collected and conditioned to test cages. The birds were then presented with a choice of treated and untreated (control) grain during a four-day study. Grain consumption was recorded daily. The study included a determination of the discrimination threshold – AQ concentration required for repellency action. The study also assessed whether repellency was related to taste or odor.

Test Results

European starlings in laboratory tests were able to detect AQ at nominal rates of 151 ppm, however sufficient repellency effect required a higher dose rate. Table 1 provides the values for determining the discrimination threshold for AQ. Table 2 shows average daily feed consumption for treated and untreated grain, at varying dose rates.

The results show a repellency effect for treated feed versus untreated feed, with maximum effect at an AQ concentration of 1000 ppm. Odor test results showed that odor does not play a role in repellency. Finally, pen observations support that there were no adverse effects by sampling the AQ-treated feed.

Anthraquinone Formulation (Flight Control™) Shows Promise as Avian Feeding Repellent
U.S. Department of Agriculture, National Wildlife Research Center
August 1997

Study Objective

Evaluate effectiveness of a 50% 9,10-Anthraquinone (AQ) formulation as a grazing repellent for Canada geese.

Study Description

USDA conducted pen tests at a 2 hectare fenced pond site in northern Ohio in June 1997. The geese were captured and relocated to the site. Three pens, each consisting of two 15.2m x 18.3M test plots, one designated for treatment, the other as a control, were constructed. The geese were conditioned to the pens prior to treatment. Researchers determined the mean number of bill contacts per plot prior to treatment. Flight Control™ mixed with water was applied at a rate of 4.5 L per hectare (1/2 gallon per acre) using a boom sprayer to the plots designated for treatment. Researchers observed the post-treatment mean number of geese, bill contacts, and mean mass of fecal matter on both the treated and untreated plots. Observations were made for 7 days following treatment.

Test Results

In pen tests, 2.5 times more bill contacts per minute were observed on the untreated plots when compared to treated plots during the 7-day test. The mean numbers of geese per observation were greater on untreated plots compared to treated plots; contrasting pre-treatment observations when untreated plots averaged 0.4 times as many geese per observation than treated plots (Figure 1). No perceptible odor or grass discoloration was associated with the Flight Control™ treatment.

Researchers concluded that Flight ControlÔ was an effective foraging repellent for Canada geese in the 7-day pen trial. Flight ControlÔ shows promise as an avian feeding repellent.

Field Trial Using Anthraquinone (AQ) as a Repellent for Canada Geese – Fort Collins, CO
Genesis Laboratories
March 1997

Study Objective

Test the field efficacy of 9,10-Anthraquinone as a repellent for Canada geese.

Study Description

The field study was conducted in Ft. Collins, CO at a corporate site, from February 20, 1997 to March 21, 1997. The test site was a large Kentucky bluegrass lawn, used throughout the year by both resident and migratory Canada geese for feeding, resting, and nesting. Two 1.04-acre test plots on a lawn area heavily used for feeding, one untreated (control), and one designated for treatment were established. One meter wide transects were made in each test plot. Pretreatment and post-treatment geese count observations were made from 0800 to 0821 each day at five-minute intervals. Dropping counts within the transect were also taken each day at the same time. The treated plot was sprayed at a rate of 1,894 g/acre with the AQ formulation, mixed with water as a spray carrier.

Study Results

Researchers measure a 95% reduction in geese activity on the treated plot, indicating a decrease in use by geese after treatment with AQ. A 312% increase in geese activity was measured on the control plot after spraying of the treated plot. Secondary evaluation of dropping counts showed a 64% reduction in droppings in the treated plot, versus a 52% increase in droppings in the control plot.

Researchers concluded that the study supported the efficacy of AQ as a field repellent for Canada geese, even under varied weather conditions, including snow accumulation. Observations demonstrated geese avoidance of the treated plot for several days. Geese fed freely throughout the rest of the property, including the control plot, often as close as 5 feet to the treated plot, but would not cross onto the treated plot. This may have indicated a learned response to avoid the treated area. There were no observed adverse effects to the geese when exposed to the treated area.

Airport Application of Flight Control™

Flight Control™ was applied using label instructions to selected turf areas of the Ronald Reagan National Airport. Turf areas were selected based on historical data collected by the USDA Wildlife Service personnel assigned to the airport to help manage the bird strike risk. Airport personnel used existing 200-gallon drop spray equipment to apply Flight Control™. A bird identification survey was conducted twice per month from October through December and compared to similar surveys taken the prior year. The survey recorded bird species, bird numbers, location of bird by habitat, (e.g. grass, structure, flying, runway, tree), and by behavior, (e.g. feeding, roosting, loafing). Based on the results of the survey, a treatment protocol was developed to spray the most bird intense locations first. Additional spraying would be done after the first results are reviewed.

Application

A total of approximately 30% of the total turf area was treated out of approximately 300 acres of turf inside the fence line at the airport. Flight Control™ was mixed with water in the spray tank as required by the label. Flight Control™ was used at a rate of ½ gallon per acre sprayed. A commercial sticker was added to the water as recommended by the label. Flight Control™ was applied by using a 200-gallon drop sprayer immediately after the grass was cut during dry weather. Spraying began in late September and the turf area was sprayed until early December. Each spraying was in a different area of the designated treatment zone.

Observations

Jessica Dewey, USDA APHIS, Wildlife Service, conducted all bird surveys. A complete bird survey was taken prior to application of Flight Control™ at eight predetermined observation positions around the perimeter of the airport. Other harassment techniques continued during the test period that confounds conclusive evidence of performance.

Average bird count per survey day

	Oct.-Dec. 1997	Oct.-Dec. 1998	% reduction
American crow	0.77	0.5	
Canada goose	0	0	
European starling	73.8	12.3	
Mourning dove	0.11	0.8	
Pigeon	0.55	0	
Total	**234.6**	**84.5**	**82%**

Observations made by Al Barba and the field crew who applied the Flight Control™ indicated that the Starling flocks were repelled from the sprayed areas of turf.
Bird flocks tended to be found in areas surrounding the treated zones in normal concentrations. The data confirmed that total bird counts for the airport matched previous year surveys.

Average bird count over whole airport for all types of cover

	Oct-Dec 1997	Oct-Dec 1998	% Reduction
American crow	5.66	8.66	
Canada goose	22.33	111.66	
European starling	354.89	319.17	
Mourning dove	22.78	30.83	
Pigeon	19.44	22.83	
Total	**425.10**	**493.15**	**No Effect**

The birds on the ground where Flight Control™ was applied as an anti-feedant were repelled but we cannot be certain of the statistical validity of this test.

Conclusions

Flight Control™ shows promise for use as a treatment as a repellent for birds on turf surfaces. Bird survey results for birds above or on other parts of the airport remained relatively unchanged during this trial. We would encourage more statistically meaningful testing be done at airports to confirm these initial observations. We believe a new tool is available for those who learn the application strategy for effective use of Flight Control™.

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