A USGA-SPONSORED RESEARCH PROJECT

Developments in Canada Goose Repellents

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The development of a repellent would allow golf courses to reduce nuisance problems and turf damage caused by foraging Canada geese.

IN THE EARLY '60s, federal and state wildlife agencies began to implement strategies to increase Canada goose populations across the United States. According to the North American Waterfowl Management Plan, the goal was to have more than 2.9 million wintering Canada geese by the year 2000. The success of the Waterfowl Management Plan can be attributed to restoration projects where Canada goose goslings were released into certain locales to establish resident flocks. In addition, protective measures, such as hunting closures, predator-proof nesting structures, predator controls, and winter aeration of ponds and lakes to keep open water were implemented to help newly released geese. Canada goose populations responded favorably to these efforts, with recent estimates indicating more than 3.5 million wintering geese in the United States. Traditional migration routes and wintering areas changed with time. Today, Canada geese have adapted to a wide variety of habitats, including the urban environment, where they are termed "non-migratory residents."

While these population increases are an important step in the conservation of waterfowl, Canada geese also are implicated in habitat destruction, crop depredation, and safety and nuisance problems. Fifteen years ago, most golf course superintendents never would have dreamed that Canada geese would be grazing on greens, generating fecal obstacles, affecting water quality, chasing golfers, and generally playing havoc with the game of golf. Foraging urban and suburban geese damage grass in parks, backyards, and on golf courses. Feces left by geese reduce the aesthetic value and recreational use of these areas, and negatively impact water quality and public health. Geese also may pose a hazard to aircraft safety at airports. These concerns stimulated efforts to develop effective, economical, and environmentally safe repellents that deter grazing geese.

The development of a Canada goose repellent for use on agricultural crops and turf has become a top priority for researchers at the Denver Wildlife Research Center. In 1989, a research planning document was developed which had as a goal the registration of a repellent for waterfowl. The "Plan" outlined a systematic series of chemical screenings, laboratory tests, and field evaluations aimed at registration of a selected repellent with the Environmental Protection Agency (EPA). The project is now nearing completion thanks to support from the USGA.

Screening Potential Repellents

Two compounds, methyl anthranilate and DRC-156, were selected from a list of over 2,000 compounds that had been screened for bird repellency properties. The two compounds met criteria of being environmentally safe, effective, economical, and biodegradable. Methyl anthranilate is registered with the Food and Drug Administration as a flavor additive for human and animal foods. It occurs naturally in citrus and has the smell of concord grapes. In its technical state, methyl anthranilate will volatilize in less than 30 hours. To increase its longevity, a special recall designed encapsulation system holds the repellent until it is triggered by grazing geese. At concentrations between 0.5% and 1.5%, it is repellent to most bird species, including waterfowl. DRC-156, at a concentration of 1.0%, also is repellent to birds. This repellent causes a slight post-ingestional sickness (stomach-ache) that seems to trigger food aversion learning in birds that ingest the material with a food product. In the case of Canada geese, after experiencing the repellent they are able to distinguish the difference between treated and untreated sites, thus avoiding treated areas.

Laboratory and Enclosure Testing

From 1990 to 1992, various formulations, concentrations, and application rates of methyl anthranilate and DRC-156 were systematically tested on a laboratory diet (whole kernel corn) and grass that was exposed to geese. Initial feeding tests with methyl anthranilate at 1% and 2% concen-

trations indicated that Canada goose consumption of treated food (whole kernel corn) was reduced by over 90%. DRC-156 showed similar results. The significant goose avoidance of treated food at low concentrations and the consistent avoidance throughout the period warranted further testing of these repellents on actual grass plots.

A series of enclosure tests was conducted. The enclosure allowed replicated testing of goose repellents on 12 Kentucky bluegrass plots measuring 40 × 40 feet with fixed numbers of geese. It also allowed the evaluation of such factors as irrigation and mowing on the effectiveness and longevity of a potential repellent. Methyl anthranilate and DRC-156 continued to show promising results when tested in the enclosure. Application rates of 4, 8, and 16 pounds per acre were evaluated for both repellents. Methyl anthranilate applied at 8 pounds per acre or higher was effective in causing geese to completely avoid treated grass plots; however, the repellency of methyl anthranilate showed signs of decreased effectiveness by 10 days after treatment.

In experiments with DRC-156, application rates of 8 pounds per acre and higher also were effective in reducing goose activity on treated grass plots. Furthermore, geese responded relatively fast to the treatment (i.e., complete avoidance of the site was observed in two days). Geese continued to avoid treated grass plots for 20 days. When geese were removed and new geese were introduced onto the same treated plots, repellency was maintained for an additional 20 days.

Field Testing

Resident and migratory flocks of Canada geese in the Denver, Colorado, metropolitan area cause nuisance and damage problems at several of the local courses for much of the golfing season. Rolling Hills, Foothills, Raccoon Creek, and Indian Tree golf courses were selected to evaluate DRC-156. The treatments were applied once at the rate of 8 pounds per acre during a 46-day test at the peak of the goose season. Data were collected on numbers of geese and the amount of feces present on greens and fairways. Grass samples also were collected at 5-day intervals to determine degradation rate of the repellent. Overall, goose counts and feces collections indicated that DRC-156 significantly reduced bird use of the treated areas at the four golf courses an average of 21 days. In the best case, geese at the Foothills Golf Club avoided treated areas for 39 days after treatment, and the numbers of geese using the golf course decreased dramatically. A new and improved methyl anthranilate formulation is scheduled for field testing in 1994.

Conclusion

DRC-156, when registered with the EPA for use on golf courses, will offer golf course superintendents a practical solution to Canada goose problems. At a projected application cost of $20 per acre, DRC-156 would be cost effective for use at most golf courses experiencing goose problems. To date, initial data required by EPA for the technical product have been submitted for methyl anthranilate and DRC-156. It is hoped that both products will be available for commercial use within a year.

For more information about animal damage control, please contact the Denver Wildlife Research Center, APHIS Animal Damage Control, U.S. Department of Agriculture, P.O. Box 25266, Denver, CO 80225-0266.