FIELD EVALUATION OF WHITE MINERAL OIL TO REDUCE HATCHING IN CANADA GOOSE EGGS

JOHN L. CUMMINGS, U.S. Department of Agriculture, Animal and Plant Health Inspection Service, National Wildlife Research Center, Fort Collins, CO 80524
MIKE E. PITZLER, U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Animal Damage Control, Barrigada Heights, Guam 96921
PATRICIA A. POCHOP, U.S. Department of Agriculture, Animal and Plant Health Inspection Service, National Wildlife Research Center, Fort Collins, CO 80524
HEATHER W. KRUPA, U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Denver Wildlife Research Center, Denver, CO 80225
TIM L. PUGH, U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Animal Damage Control, Pierre, SD 57501
JERRY A. MAY, U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Animal Damage Control, Olympia, WA 98502

Abstract: Canada geese (*Branta canadensis*) continue to impact recreational areas in and around Lake Washington, Seattle, Washington in spite of relocation programs. Concerns include overgrazing, leaving fecal deposits, contributing to degradation of the water quality, and potentially transmitting avian disease. These concerns have stimulated efforts to evaluate additional management strategies for Canada geese, such as egg oiling, to reduce growth of the Lake Washington goose population. We determined the effects of Daedol® 50 NF white mineral oil on hatchability of Canada goose eggs at Lake Washington, Seattle. Nests were randomly selected to a treatment group: white mineral oil (201 eggs from 39 nests) and control (140 eggs from 32 nests). Eggs were sprayed once at least 8 days before the expected hatching date. Each egg was sprayed using a hand-held sprayer calibrated to deliver 7 ml of product per egg. Eggs were visually monitored for signs of hatching at 1 day pre and 1, 5, 10, 15, 20, and 25 days post-expected hatching date. Of the 201 treated eggs and the 140 untreated eggs, 0 treated and 81 untreated eggs were successfully incubated to term. Canada geese continued to incubate treated eggs from 1 to 30 days (mean = 14.2 days) beyond the expected hatching date. Treatment of Canada goose eggs with white mineral oil is effective, inexpensive, and environmentally and socially acceptable as a management tool. Recent changes, however, in registration regulations by the Environmental Protection Agency has prompted the evaluation of alternative oils (food grade) that would not have to be registered with the Environmental Protection Agency for use as an egg oil agent.

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Foraging Canada geese (*Branta canadensis*) damage grass in parks, backyards, and on golf courses (Laycock 1982). Feces left by geese reduce the aesthetic value and recreational use of these areas and negatively impact water quality and public health (Conover and Chasko 1985, Mott and Timbrook 1988). Management to control numbers of geese usually involves the use of pyrotechnic devices, trapping and relocation, mechanical scare devices (USDA 1986), relaxing hunting regulations,

and sterilization (Oetting 1987). The use of these techniques, however, is often limited by cost, logistics, and/or effectiveness. New bird damage control methods and comprehensive integrated pest management plans based on sound ecological principles are needed to solve problems caused by geese.

One strategy to manage Canada goose populations nesting in urban settings is egg addling (shaking, freezing, removal, destruction, pricking a hole in the egg, or oiling). However, shaking, freezing, removal, and destruction are labor intensive (Christens and Blokpoel 1991; L. Terry, pers. commun. 1993). Shaking by hand causes hand and arm fatigue which would make it ineffective in an Animal Damage Control (ADC) operational program. Removal, destruction, and pricking may cause re-nesting. Egg oiling has been effective in addling gull eggs (Christens and Blokpoel 1991). An advantage of oiling over other techniques is that the incubating birds continue to incubate eggs well past the normal hatching time, which precludes renesting (Christens and Blokpoel 1991).

In the laboratory and field, white mineral oil has been used successfully to suppress hatchability of chicken, ring-billed gull (*Larus delawarensis*), herring gull (*Larus argentatus*) eggs, and Canada goose eggs (Blokpoel and Hamilton 1989, Christens and Blokpoel 1991, Christens et al. 1995, Cummings et al. 1995 unpubl. rep.). Treatment levels of white mineral oil varied from partially coating eggs (wiped with an oil saturated gauze pad) to completely coating eggs (spraying ~15 ml per nest). The later treatment reduced hatching 99-100% in ring-billed gull and herring gull eggs (Christens and Blokpoel 1991).

White mineral oil is currently registered with the Federal Drug Administration (FDA) for use by commercial egg producers for application to chicken eggs to reduce the decline in quality of eggs being shipped to consumers (Blokpoel and Hamilton 1989). One such white mineral oil is Daedol® 50 NF, which is chemically inert, odorless, nonpoisonous, highly purified (100%; Daminco, Inc., Mississauga, Ont., Can.) and therefore would not contaminate the environment when applied on a large scale (Christens and Blokpoel 1991). It is inexpensive ($8.50/L). White mineral oil occludes pores in the egg shell, thus asphyxiating the developing embryo by reducing diffusion of respiratory gases.

Since 1990, The Washington ADC program has cooperated with the Washington State Waterfowl Management Committee, which is composed of local, state, and federal agencies, to manage expanding Canada goose populations in the greater Seattle Area. The ADC program has relocated over 4,200 Canada geese during this period. The number of Canada geese using traditional trapping sites has decreased since the start of the relocation program (M. Pitzler, pers. commun. 1993). In spite of these control efforts, Canada geese continue to impact recreational areas in and around Lake Washington, Seattle, by overgrazing, leaving fecal deposits, contributing to degradation of the water quality, and potentially transmitting avian disease (Benenson 1985). These concerns have stimulated efforts to evaluate additional management strategies for Canada geese, such as egg oiling, to control population growth.

We initiated this study as part of the data gathering process to register white mineral oil with the Environmental Protection Agency (EPA). EPA approval and the subsequent label would allow ADC personnel to use white mineral oil on an operational level. The purpose of this study was to determine the effects of white mineral oil (Daedol® 50 NF) on hatchability of Canada goose eggs in the vicinity of Lake Washington, Seattle, Washington.

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METHODS

The study was conducted at Lake Washington, Seattle, Washington from 15 March to 12 April 1993. Lake Washington shorelines and islands offer feeding and nesting areas for a large population of Canada geese. From 15 March through 12 April, Lake Washington was searched bi-weekly for active goose nests. Each nest was marked with a numbered wooden stake and the date, location, and number of eggs present in the nest was recorded. Based on a laying rate of 1 egg per day and maximum clutch size of 9 eggs, the nest was checked again 7-9 days later to determine actual clutch size and laying date of the first egg. The expected hatching date (EHD) for each nest was calculated based on an assumed incubation period of 28 days.

At Lake Washington, nests were randomly assigned to a treatment group: white mineral oil (39, Daedol® 50 NF) or control (32, untreated). All Canada goose eggs in nests selected for treatment with white mineral oil were sprayed once at least 8 days before EHD. Each egg was sprayed using a hand-held sprayer calibrated to deliver 7 ml of product per egg (i.e. 1 egg/nest was sprayed for 1 sec., 2 eggs/nest for 2 sec., 3 eggs/nest for 3 sec., etc.). The wand of the hand-held sprayer was held approximately 10 cm above the eggs in the nest and moved across the tops of the eggs as the oil was applied. At some nests, where the adult was still sitting on the eggs when approached, the adult had to be coaxed to stand-up so that the eggs could be treated. The amount of white mineral oil applied was adequate to soak the nest so that when the eggs were turned by the goose, we assumed all sides of the eggs would be coated with oil. Eggs were visually monitored for signs of hatching at 1 day pre- and 1, 5, 10, 15, 20, and 25 days post-EHD. In addition, nest desertion, destruction, and egg predation was recorded.

RESULTS

Canada geese initiated egg laying 20 March and laying peaked on 1 April. Average clutch size was 4.9 (range: 2-7) and hatching success of untreated eggs was 58%. We treated 201 eggs from 39 nests with white mineral oil; 140 eggs from 32 nests were retained as controls (Table 1). Of these, 0 treated and 81 untreated eggs were successfully incubated to term. Canada geese continued to incubate treated eggs from 1 to 30 days (mean = 14.2 days, S.D. = 10.3, n = 92) beyond the expected hatching date. Only 1 untreated nest (5 eggs) was incubated past its expected hatching date; eggs in this nest were not viable. Other factors affecting nesting success was predation by mink (*Mustela vison*) and raccoon (*Procyon lotor*) and fluctuation in water levels on Lake Washington which flooded 17 nests (81 eggs).

Table 1. **Canada goose nesting success in testing the effectiveness of white mineral oil for reducing hatchability, 31 March through 28 May 1993, Lake Washington, Seattle, Washington.**

	Total			Hatched		Failed					
						Predation		Other		Incubated Past EHD	
Treatment	Nests	Eggs	Ave. Eggs/Nest	Nests	Eggs	Nests	Eggs	Nests	Eggs	Nests	Eggs
Control	32	140	4.4	22	81	8	33	1	4	1	5
Treated	39	201	5.2	0	0	5	32	16	77	18	92

DISCUSSION

A single application of white mineral oil proved effective in preventing Canada goose eggs from hatching. Geese continued to incubate eggs up to 30 days beyond the EHD. In most cases, this would preclude renesting and eliminate recruitment into the population. However, natural egg loss due to predation and environmental factors could influence recruitment if it occurred sufficiently early in incubation to allow geese time to renest. In our study, natural egg loss that occurred was in late incubation and renesting was minimal.

Egg oiling studies in gull colonies suggest that spray timing is crucial to reducing egg hatchability. Blokpoel and Hamilton (1989) showed that treatment of gull eggs early in incubation did not completely suppress hatching. In comparison, our study indicates there is no difference in egg hatchability since eggs were 1 to 21 days into incubation when sprayed.

We agree with Christens and Blokpoel (1991) that white mineral oil has advantages in regards to its effectiveness, low environmental risk, approval by FDA, and cost. The cost of spraying at Lake Washington was $6.00/100 eggs for oil, $15.00/sprayer, and $60.00/100 eggs labor. Labor costs depend upon nesting habitat and density. Since egg laying at Lake Washington was completed in <30 days only one application was required to completely suppress hatching. An additional application, however, may be needed if natural egg loss occurred early in the incubation period.

MANAGEMENT IMPLICATIONS

Treatment of Canada goose eggs with white mineral oil is effective, inexpensive, and environmentally and socially acceptable as a management tool. However, in 1994, the EPA announced in the Federal Register that it was proposing to deregulate several types of "food oils" from the formal registration process (Federal Register 1994). The substances listed would not need to be registered as long as the mode of action of the pesticide is considered nontoxic. Therefore, we conducted a lab and field study to determine if any of the food oils listed would be as effective as white mineral oil in reducing the hatching success of eggs.

A laboratory test conducted in 1995 indicated that castor, corn, linseed, safflower, and soybean oil were as effective as white mineral oil in suppressing hatchability of chicken eggs (Pochop et al. 1997). Corn oil was chosen to test in the field based on cost ($2.10/L) and availability. The 1995 field test indicated that corn oil reduced hatching of gull eggs 97% and white mineral oil reduced hatching 88% (Cummings et al. 1995 unpubl. rep.). In 1996, a follow-up field study was conducted where all nests that could be found in the gull colony were treated with corn oil. Eggs failed to hatch in 99.7% of the nests (unpubl. data).

On 6 March 1996, the EPA published in the Federal Register a notice exempting certain materials from regulation under Section 25(b) of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), as amended. This notice allows corn oil to be used without EPA regulation as long as the uses met certain qualifications; they were not related to public health, efficacy data were available, and certain labeling requirements were met. A technical note for the use of corn oil was developed in October 1996 and is available to ADC personnel and cooperators.

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