December 1975

An Overview of Problem Bird Management - Rural and Urban

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(Address presented at the Second Wildlife Damage Control Workshop, Kansas State University, Manhattan, Kansas, December 8-11, 1975)

Summary

The economic impact of birds on agricultural crops in the U.S. is quite substantial---perhaps as much as $100 million dollars. Methods for reducing this damage can be categorized as biological, mechanical, and chemical. The chemical approach appears to have the most potential. An avian repellent, methiocarb, has proven to be effective for reducing damage by a variety of species of birds to many sprouting and ripening crops, and ripening fruits. An avian chemical frightening agent, 4-aminopyridine (Avitrol), is federally registered for use for protecting ripening field corn and sweet corn and was shown to be effective for reducing damage in sunflowers and sorghum. An avian toxicant, 3-chloro-para-toluidine hydrochloride (DRC-1339) (Starlicide) is federally registered for reducing populations of starlings in cattle and poultry feedlots.

An Overview of Problem Bird Management in Agricultural Crops

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Bird damage to agricultural crops is a multimillion dollar problem in the United States. Objective surveys of damage to ripening field corn in the U.S. showed that birds, primarily red-winged blackbirds (Agelaius phoeniceus), caused the loss of about 6.5 million bushels each year in 1970 and 1971 (Stone et al. 1972; Stone and Mott 1973a). At 1975 prices, the cost of this damage would be $15 to $20 million. On the basis of questionnaire surveys, the nationwide loss of sprouting corn to birds, primarily common grackles (Quiscalus quiscula) and ring-necked pheasants (Phasianus colchicus), was estimated to range from $6 million to possibly $49 million in 1971 (Stone and Mott 1973b), and the grain sorghum loss to red-winged blackbirds from $2.9 to $8.9 million in 1974 (Knittle and Guarino 1975).

Regionwide or statewide estimates showed that birds (primarily redwings) damaged 1 of 10 sunflower heads in North Dakota and Minnesota in 1972 and caused the loss of more than 1% of the crop (Stone 1973a), and that damage to ripening rice in the Sacramento Valley of California may have approached about $75,000 (DeHaven 1971). Damage to sprouting and ripening rice in Louisiana in 1968 was estimated by Pierce (1970) to be more than $1 million.

Bird damage to fruit crops is also considerable. Nationwide damage to grapes by starlings (Sturnus vulgaris), finches (Carpodacus spp.), robins (Turdus migratorius), bluebirds (Sialia spp.), waxwings (Bombycilla spp.) and several undetermined species of sparrows was at least $4.4 million in 1972; about 90% of the production and probably more than $3.7 million of the damage occurred in California (Crase et al. 1975). Nationwide damage to highbush blueberries in 1972, primarily by starlings, robins, and grackles, was $1.6 to $2.1 million, or about 5% of the crop (Mott and Stone 1973). From 7 to 17% of Michigan's 1972 tart cherry crop was lost to birds, chiefly starlings, robins, and Baltimore orioles (Icterus galbula); the estimated loss was between $1.8 and $4.3 million (Stone 1973b).

Information is either lacking or limited to local areas on the amount of damage caused by birds to other crops, such as peanuts (by blackbirds), lettuce and other truck crops, sweet cherries and other fruit, and on ripening and swathed grains by blackbirds and waterfowl. From the number of crops and bird species involved in these problems, it is evident that management of problem birds that feed on agricultural crops is extremely complex. Methods for alleviating the problems depend on the number and species of birds involved, whether the birds are local or migratory, the type of damage incurred, the extent and magnitude of the problem, the time of year damage occurs, weather patterns, public opinion, and political pressure.

Types of methods used for controlling bird damage

In research, efforts in bird damage control by the U.S. Fish and Wildlife Service have been problem oriented and directed toward the development of methods for reducing damage to specific crops. However, bird damage problems are also approached on an ecological, behavioral, and environmental basis. More is being learned about the life history, movements, and

population dynamics of the species involved through nesting, banding, color-marking, and telemetry studies; about the responses of birds to various stimuli in the laboratory; and about the possible impact of chemical control methods on the environment by studies of degradation, phytotoxicity, translocation, and residues.

The methods for alleviating bird damage generally fall into three broad categories: biological, mechanical, and chemical.

Some examples of biological control methods are: decoy crops (e.g., planting a less valuable and more attractive crop adjacent to valuable crops to divert birds); changes in cultural practices (e.g., harvesting early or changing crop types); habitat manipulation (e.g., burning roosting vegetation or thinning branches and trees in large roosts); and development of bird resistant varieties of crops (e.g., tight-husked corn or sorghum with a high tannin content). These methods have not gained wide acceptance with agriculturists.

Some mechanical means for reducing damage include the use of propane or acetylene exploders, shell crackers, netting, traps, and alarm and distress calls of birds broadcast through mobile or stationary units or played on record players. These methods are widely used and often are very effective.

The chemical approach for reducing bird damage to agricultural crops appears to offer the most potential, however, and the Service's major research efforts have been concentrated on this approach.

Chemicals applied for control of birds must be species selective, effective, economically practical, and environmentally safe. Potential chemicals for managing bird problems include repellents, stressing agents, toxicants, chemosterilants, and frightening agents.

Repellents

Major effort has been put into the development of chemical repellents. The most promising compound found to date is 3,5-dimethyl-4-(methylthio) phenol methylcarbamate. Its common name is methiocarb and its trade name, Mesurol[R]. It is an experimental insecticide that is also a broad-spectrum avian repellent and extremely effective for red-winged blackbirds. Its primary mode of action appears to be a post-ingestinal disturbance in the bird that eats it. Thereafter, the bird avoids the crops treated with it.

Methiocarb has no known chronic toxicity, no secondary hazards, no direct effect on reproduction. It is detoxified by ultraviolet light. Its half life ranges from 4 days in alkaline soils to 56 days in acidic soils. It is relatively safe and no known avian mortality has ever been recorded in field trials at practical use levels. Effective protection has been afforded after applications as low as 2 oz per acre on seeds and 2 lb per acre on ripening crops.

As a seed protectant, methiocarb has proven effective for reducing damage to newly planted corn seed from blackbirds, crows (Corvus spp.), and pheasants. Initial studies with slurry treatments (0.5%) on seed corn in 1967 in South Dakota showed that about 22 times more sprouts were

pulled by pheasants in untreated fields than in treated fields (West et al. 1969). Significant reductions in damage were also obtained in tests in Texas with boat-tailed grackles, Cassidix mexicanus (West and Dunks 1969); in New York with a variety of blackbird species (Guarino and Forbes 1970); and in South Carolina with blackbirds and crows (Stickley and Guarino 1972). More recently, 0.5% dust treatments on the corn seed in the hopper-box before planting gave about 70% protection from pheasants in South Dakota (Besser and Lewis 1975) and even better protection from blackbirds (mostly) in New York (Stickley and Ingram 1975).

Methiocarb has also been shown to be effective for reducing damage by redwings to sprouting rice in Texas (Besser 1973) and Louisiana (Guarino et al. 1975a), for reducing damage to emergent lettuce and sugar beets in California caused primarily by horned larks (Eremophila alpestris) (DeHaven et al. 1975), and for reducing damage by eared doves (Zenaida auriculata) to soybean seedlings in Colombia, South America (Thompson and Agudelo 1969). Federal registration of methiocarb (Mesurol 50% Hopper-box Treater) for use as a dust treatment for corn seed for protection against blackbirds has been obtained for the eastern U.S. (EPA Registration Number 3125-309).

As a ripening grain crop protectant, methiocarb has shown potential for reducing damage by redwings and tricolored blackbirds (A. tricolor) to ripening rice in California (DeHaven et al. 1971; Crase 1974), and to grain sorghum in South Dakota (Mott and Lewis 1975) and Oklahoma (Schafer et al. 1973; Mott et al. 1974) when sprayed on the heads at a rate of 1-3.2 lb/acre.

As a repellent for protecting fruit crops from a variety of bird species, methiocarb has given up to sixfold differences in damage between treated and untreated plots when sprayed to drip on crops at insecticidal levels (1 lb methiocarb/100 gal water). Protection was obtained on both sweet

and tart cherries in Michigan (Guarino et al. 1973; Guarino et al. 1974); on wild lowbush blueberries in New Hampshire (Bollengier et al. 1973); on cultivated highbush blueberries in Michigan (Stone et al. 1974); and on grapes in New Hampshire (Bollengier et al. 1971) and California (Crase 1975). A total of 27 species of birds damaged the fruit in these tests. The primary species involved were robins and starlings in cherry and blueberry damage and house finches (Carpodacus mexicanus) and starlings in grape damage.

Frightening Agents

The most important accomplishment to date for reducing bird damage to agricultural crops has been the development and registration of 4amino-pyridine (4AP), commonly known as Avitrol. Avitrol® FC Corn Chops-99 was federally registered for nationwide use against blackbirds in field corn in April 1972 and in sweet corn in August 1975. The registration for use in sweet corn does not include states in the northeastern and southeastern U.S., where satisfactory efficacy data are lacking. The chemical 4AP is considered a frightening agent because most birds that ingest treated baits react by emitting distress cries while flying erratically in circles. This behavior frightens other members of the flock from treated fields. The agent is effective at low use levels (1 lb per 3,300 acres); it is relatively safe (less than 1% of the flocks of target species are killed and hazards to nontarget species are generally minor); there are no known secondary hazards, no phytotoxic effects, and no effects on bird reproduction; and residues on treated crops are well within the established tolerance of 0.1 ppm.

Initial tests with 4AP in eight sections of field corn being damaged by blackbirds in South Dakota in 1965 showed that the treatment reduced

damage by redwings (primarily) by 85%; corn worth about $6,500 was saved at treatment costs of $650 (De Grazio et al. 1972). In these tests, fields were baited with 1 lb/acre of cracked corn treated to contain 3% 4AP and diluted 1:29 with untreated cracked corn. A 1:99 dilution rate later used in the Dakotas, Ohio, and Michigan gave similar results. The registered dilution rate is 1:99.

Studies in 1974 with Avitrol FC Corn Chops-99 in sweet-corn fields showed that blackbirds damaged 4 times as much corn in untreated as in treated irrigated fields in Idaho (Mott and Royall 1975) and 10 times as much corn in untreated nonirrigated fields in Wisconsin (Knittle et al. 1974). Data collected in North Dakota sunflower fields showed reductions in damage of 82% in 1973 (Guarino 1974) and 65% in 1974 (Besser and Cummings 1975). Federal registration of this use is pending. Initial studies in sorghum in Kansas (Guarino et al. 1975b) and Oklahoma (Cummings et al. 1975), although inconclusive, indicated the potentially high value of Avitrol for protecting this crop from blackbirds.

Stressing Agents

The avian stressing agent PA-14, more commonly known as Tergitol 15-S-9, was registered by the U.S. Fish and Wildlife Service in February 1974 for use by or under the supervision of government personnel trained in bird control. This registration culminated several years of laboratory and field testing by the Service's Patuxent Wildlife Research Center, which demonstrated the efficacy and safety in reducing large populations of roosting starlings and blackbirds by the application of wetting agent solutions or surfactants (Lefebvre and Seubert 1970). The PA-14 lowers the surface tension of water and enhances wetting. When roosting birds are treated with PA-14 immediately before or during cold, wet weather, mortality occurs when the bird's plumage is wetted sufficiently

to cause excessive loss of body heat. The temperature should be near 40-45° F and at least C.5 inch of rain should fall during or immediately after treatment. This agent is toxic to fish and to some degree, to plants. Spraying of tree roosts should be confined to the period when trees are dormant.

Toxicants

The development of toxic agents has been directed primarily at starlings. Starlicide® was federally registered in 1967 for use in cattle feedlots and poultry-raising operations. The chemical (3-chloro-p-toluidine hydrochloride), coded DRC-1339 by the Denver Wildlife Research Center, is incorporated into Purina Layena® poultry pellets at a 1.0% level. Treated pellets are diluted with untreated pellets at a 1:10 ratio and this bait is scattered thinly in empty pens and alleyways. Initial tests with DRC-1339 in a cattle feedlot in Nevada in 1963 showed a population reduction of about 75% of the approximately 2300 starlings using the lot in about 2-3 days (Besser et al. 1967). The baiting of starling staging areas has also been effective for reducing populations and problems in feedlots, but this use is not registered. West (1968) reduced a local wintering population of 250,000 starlings in Colorado by probably more than 60% by baiting two staging areas. A slow-acting toxicant, DRC-1339 is highly toxic to starlings (acute oral LD_{50} = 3.8 mg/kg), generally less toxic to most other birds and relatively nontoxic to rats (DeCino et al. 1966). The safety of the compound can be increased by careful consideration of bait material, bait placement, dilution rates, and timing. Its effectiveness is probably related to its slow action, as it takes up to 48 h for birds to die after they ingest a lethal dose, and they do not show bait site aversion.

Chemosterilants

The only avian chemosterilant that is federally registered is Ornitrol[R] (azacosterol; 20, 25 - diazacholestenol dihydrochloride), for use on feral pigeon populations. The label recommends that 7.5 lb of treated bait be exposed daily for every 100 pigeons. Woulfe (1968) stated that azacosterol on whole corn bait (0.1%) fed to pigeons for 10 days inhibited reproduction for about 6 mos, and reduced a pigeon population in Maine from about 3,000 to about 500 in 1 year. Wofford and Elder (1967) also greatly diminished local pigeon populations in extensive field trials in Missouri.

Researchers at the Service's Denver Wildlife Research Center are now engaged in a program to find and develop a chemosterilant for reducing damage by blackbirds. Efforts have been concentrated in finding a chemosterilant that will sterilize male redwings for at least 8 months with a single dose, that will not affect libido, that can be formulated in a well-accepted grain bait, and that is environmentally safe and potentially registerable. The studies are being conducted in a four-stage program: (1) development of suitable chemosterilants in the laboratory; (2) testing the concept of using male sterility to control populations of redwings by vasectomizing birds in local marshes (study completed by Bray et al. {1975} indicated that the use of male chemosterilants would be feasible for reducing redwing populations); (3) the small-scale field testing of candidate sterilants; and (4) the gathering of ecological information on a large regional population on which compounds can be tested. This program was described in greater detail by Guarino and Schafer (1973).

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Information Presented at the Wildlife Damage Control Workshop, December 8-11, 1975, Kansas State University, Manhattan, Kansas, by William K. Pfeifer, Animal Damage Control Supervisor, Fish and Wildlife Service, Bismarck, North Dakota.

Bird Control

Avitrol, a fright producing agent, is a bird repellant used to reduce blackbird damage in corn and sunflowers. The 99:1 diluted cracked corn bait is applied in 50-foot swaths by aircraft or a highboy sprayer covering one-third of the field at a rate of one pound per field acre. No bait is placed within 50 feet of the edge of the field. Generally three applications, a week apart, is satisfactory; however, severe conditions may require more treatments.

The bait is applied by individuals who have been trained in bird control and application is supervised by the U.S. Fish and Wildlife Service.

Aircraft are calibrated on the ground before application in the following manner. The seeding attachment is adjusted to deliver 9 pounds of bait in 17 seconds. This timing is approximate for aircraft flying 95 miles per hour.

A plate with four rectangular openings measuring 1 x 1 1/4 inches is attached to the seeder gate. This attached plate allows more even flow of the bait than the long, narrow seeder opening which is normally used.

Most aerial applicators charge about $1.70 per field acre for application which includes the cost of the bait.

At present, Avitrol may be applied in sunflowers under state registration in the States of North Dakota, South Dakota and Minnesota only.

To achieve the best results, Avitrol, like any other control tool, must be applied as soon as the birds enter a field. It is very important that alternate food sources, such as grain stubble, be available to the birds.