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ABSTRACT

Although the European starling (*Sturnus vulgaris*) has long been considered a serious depredator of certain crops, especially fruit, it has not been thought to seriously damage maturing corn. In fact, most investigators have considered starlings to be beneficial in cornfields because of their consumption of earworms (*Heliothus zea*) and other insects. In controlled cage studies we determined starlings were capable of causing substantial damage to maturing field corn. Starling damage to a long-husked resistant and to a short-husked susceptible hybrid was 1.6 and 2.7 times greater, respectively, than that caused by male red-winged blackbirds (*Agelaius phoeniceus*). The long- and short-husked hybrids suffered a mean loss of corn per ear of 3 and 45%, respectively, to starlings. These findings support recent field observations of starlings feeding on maturing field corn in Ontario, Canada. We conclude that starlings have the potential for becoming serious depredators of the loose or short-husked hybrids of corn that are becoming popular because of their drying qualities.

INTRODUCTION

Starlings have long been considered serious depredators of certain agricultural crops, especially fruit, but their contribution to bird damage to maturing corn has not been clearly defined. Kalmbach (1931) believed that in many situations reports of starling damage to corn were subject to errors of bird identification. He noted that only 14 of 1,059 starlings collected during the ripening and harvest season had fed on corn. On a few occasions Kalmbach observed small flocks of starlings actually tearing the husks of corn and feeding on the kernels but not inflicting serious damage. Nonetheless, Kalmbach mentions that other observers have made positive identification of starlings damaging corn and have documented that flocks of starlings have damaged sweet corn to the extent of from 10 to 25% of the yield. He summarized the relation of the starling to maturing corn crops this way: "That while the examination of a large representative series of stomachs have shown that the bird is not an extensive feeder on corn, field observation has revealed that under certain favorable local conditions, as in the vicinity of roosts, the bird may do damage."

Cardinell and Hayne (1945), in their study of bird damage to corn in Michigan, observed no large flocks of starlings in cornfields but noted small flocks were often seen about farms of the region. In 1952 Whitney (1954), while studying the incidence of field corn ear molds in Ontario, reported that the damage to hybrid corn in 10 fields was caused primarily by the red-winged blackbird and the starling. No supporting evidence was given for this claim.

Stewart (1973) noted from 1969 to 1972 increasing numbers of cornfields in North Carolina and Virginia with most larvae of corn earworms and fall armyworms (*Spodoptera fungiperda*) removed but no corn kernels damaged except those eaten by the larvae. Finally he observed a flock of starlings removing larvae from corn as they quickly worked over an entire field. Stewart's conclusions were that starlings removed larvae without eating corn and that larvae were the preferred food because captive

starlings readily ate corn in the same stage of development. The local and spreading nature of his observations suggested that starlings were developing a new feeding behavior in this region. He concluded starlings may often be erroneously blamed for damage merely because of their association with redwings, the chief depredators of maturing corn in North America (Stone and Mott, 1973).

Williams and Jackson (1981) reported that only 3% of the diet of starlings collected in late summer and early fall 1974 in north-central Ohio was corn and 24% was insects. One Canadian report on bird damage to corn (Potvin et al., 1976) stated that "the starling does not eat corn" while another (Somers et al., 1981) reported fresh corn in the gullets of five out of six starlings shot in a cornfield. This latter report indicated that starlings are potential and capable depredators of maturing field corn.

Thus, the evidence from the literature seems somewhat circumstantial and contradictory on whether starlings deliberately open ears to eat corn or only incidentally damage corn while eating associated insects. Corn in the gullets of starlings could be incidental to their probing for insects, from feeding on corn ears previously opened by redwings, or from feeding on the ground and picking up scattered bits of corn following redwing feeding activity. Our objective was to determine the degree to which starlings are capable of opening the husks of undamaged ears and their inclination to do so solely to obtain corn kernels as a source of food. We accomplished this by comparing the damage done by starlings with that of redwings to two hybrids of field corn in a controlled aviary test.

METHODS

Hatching-year male and female starlings were captured in June and July 1982 in decoy traps in Erie County, Ohio. After-hatching year male redwings were captured with mist nets at a marsh roost in Ottawa County, Ohio in July. Bird were held in an outdoor, roofed, and wire-enclosed aviary isolated from human activity. Nine test cages (1.5 x 1 x 1 m), each holding six birds (six cages with starlings, three with redwings), were supplied with perches, water, grit, cracked corn, and sunflower seeds (redwings only), and pullet starter. Birds were also provided with fresh ears of sweet corn and field corn the week before the experiments began in mid September.

The corn ears being tested were held by two nails on supports attached at 20-cm intervals along one side of a 1.5-m rack placed on the floor of the cage. The ears were placed at the same orientation as on the plant at an angle of 30° from the vertical. In the first test, evaluations of damage were made at four stages of corn kernel maturity ranging from 27 (late milk stage) to 37 (late dough stage) days after silking (DAS). Each evaluation consisted of placing eight freshly picked ears of a known silking date, with husks intact, in each of six cages (three with starlings, three with redwings) for 6 hours (0900-1500). Four ears from each of two hybrids were randomly assigned to the eight positions on the rack at each evaluation. For 1 hour before and during the 6-hour test all other food, but not water and grit, was removed from the cages. At the end of each test the rack was removed from each cage and the bird damage (percent of kernel surface area damaged) was visually estimated for each ear (Woronecki et al., 1980). The mean damage for the four ears of a hybrid within a cage was the response variable used in the analysis. Similar test designs have previously been used to evaluate resistance of field corn hybrids to damage by redwings (Dolbeer et al., 1982; 1984).

To determine the effect an additional food source would have on the amount of damage to both hybrids, another test was run in which three cages of starlings were given corn with an alternate food supply (pullet starter) available and three cages were tested as before without an alternate food. The test was repeated on the following day and the with- and without-alternate food regime was switched between groups. The corn was 42-44 DAS for this test.

The following measurements were also made on each of the hybrids (30 randomly picked ears) at 25-30 days after 50% silking: maximum and minimum husk length,

maximum and minimum kernel length, cob length, maximum ear circumference, and weight of the dried husk (Dolbeer et al., 1982). These measurements were used to calculate the following husk characteristics: husk beyond ear tip (HBET), the distance from the tip of the corn to the maximum husk extension; husk extension (HE6), the distance from the minimum kernel row to the maximum husk extension; and husk density (HW2), the dry husk weight divided by the surface area of the ear.

RESULTS

The two corn hybrids used in this study were chosen because of their differences in husk characteristics. Hybrid A is 115-day Muncy Chief 878 and hybrid B is 97-day Pioneer 3780. Mean HBET for hybrid A was 52 mm, 2.7 times the 19 mm husk extension of hybrid B. Mean HE6 for hybrid A (94 mm) was 1.4 times that of hybrid B (68 mm). Mean HW2 for hybrid A (0.45 g/cm^2) was 1.2 times that of hybrid B (0.38 g/cm^2). The thin, short husk of hybrid B is typical of many hybrids and is presumed to speed the rate of ear drying following kernel maturation.

In the choice experiment between the two hybrids at four different stages of maturity, starlings inflicted much more damage on hybrid B than on hybrid A (Fig. 1). The paired difference between hybrids (in three cages at four maturity dates) averaged 42.1% damage with a standard error of 5.3% (t = 7.98, df = 11, $p < 0.001$). Adult male redwings tested with the same choice of hybrids at the same maturities also damaged hybrid B to a greater degree than hybrid A. The paired difference averaged 14.5% with s.e. of 2.8% (t = 5.16, df = 11,. $p < 0.001$). The mean damage by starlings was greater than redwings (Fig. 1) by 28.8% (t = 5.44, df = 22, $p < 0.001$) for the susceptible hybrid B but only 1.3% greater than redwings for hybrid A (t = 0.89, df = 22, n.s.). The short-husked hybrid B suffered a mean loss of 45% of the corn per ear to starlings compared with 17% to redwings, while the long-husked hybrid A suffered only 3% loss to starlings and 2% loss to redwings.

The percent of damage decreased for both bird species as the corn matured. Starling damage on hybrid B declined from 60% at 27 DAS to 37% at 37 DAS and the redwing damage declined from 24% to 10%. This decrease in kernels eaten is probably related to the increased biomass per kernel in more mature corn (Dolbeer et al., 1984).

Starlings damaged 3.2 times as much corn without an alternate food available as with pullet starter available (Fig. 1). The paired difference in total damage was 13.2% (t = 6.28, df = 5, $p < 0.005$). Although the average percent was reduced with the more mature (42-44 DAS) corn, the preference for hybrid B remained. The paired difference between hybrids with alternate food available was 4.4% (t = 2.88, df = 5, $p < 0.01$). Possibily a more preferred food such as insects was provided as the alternate food, the damage to the corn ears and the differences between hybrids would have been even less than was shown with pullet starter.

DISCUSSION

This test demonstrated that starlings are capable of inflicting substantial damage to ears of maturing corn. In fact, given that starlings can open husks and feed on maturing corn kernels as readily as do redwings, their potential for damage may be even greater than that presently caused by the latter species for several reasons. First, starlings consumed more corn per individual than did redwings, probably due to their larger body size [81g vs. 72g for male redwings (Clench and Leberman, 1978)] and their relatively inefficient digestive system for low protein foods (Thompson and Grant, 1968). Second, post-nesting season flocks of starlings form by late June-early July, generally a month earlier than flocks of redwings, thus making early maturing sweet- and field-corn crops vulnerable to damage. Third, the starling is the third most abundant bird species in North America and its breeding season densities are comparable to those of redwings in many parts of the midwestern and northeastern United States (Dolbeer and Stehn, 1979; 1983, Unpubl. Bird Damage Research Report 294).

We conclude that starlings have the potential for becoming serious depredators of corn, especially of the thin- or short-husked hybrids that are becoming popular because of their drying qualities. The starling's preference for insects and its physiological demand for a high protein diet would not be expected to readily change in favor of corn. However, if preferred insect populations were significantly reduced or starlings developed a preference for corn through some behavioral change in feeding, starlings could certainly become a major pest species for corn.

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LITERATURE CITED

Cardinell, H. A., and D. W. Hayne. 1945. Corn injury by red-wings in Michigan. Mich. State Coll., Agric. Exp. Stn. Tech. Bull. 198. 59pp.

Clench, M. H., and R. C. Leberman. 1978. Weights of 151 species of Pennsylvania birds analyzed by month, age, and sex. Bull. of Carnegie Museum of Natural History 5, Pittsburgh, Penn. 87pp.

Dolbeer, R. A., and R. A. Stehn. 1979. Population trends of blackbirds and starlings in North America, 1966-76. U.S. Dept. Int., Fish and Wildl. Serv., Spec. Sci. Rep. Wildl. 214.

Dolbeer, R. A., P. P. Woronecki, and R. A. Stehn. 1982. Effect of husk and ear characteristics on resistance of maize to blackbird (*Agelaius phoeniceus*) damage in Ohio, U.S.A. Prot. Ecol. 4:127-139.

Dolbeer, R. A., P. P. Woronecki, and R. A. Stehn. 1984. Blackbird (*Agelaius phoeniceus*) damage to maize: crop phenology and hybrid resistance. Prot. Ecol. [In press.]

Kalmbach, E. R. 1931. The European starling in the United States. U.S.D.A. Farmers' Bull. 1571. pp. 14-16.

Potvin, N., J. M. Bergeron, and C. Fernet. 1976. Regime alimentaire d'oiseaux frequentant un agrosysteme. Can. J. Zool. 54:1992-2000.

Somers, J. D., R. G. Gartshore, F. F. Gilbert, and R. J. Brooks. 1981. Movements and habitat use by depredating red-winged blackbirds in Simcoe County, Ontario. Can. J. Zool. 59(11):2206-2214.

Stewart, P. A. 1973. Starlings eat larvae on corn ears without eating corn. Auk 90:911-912.

Stone, C. P., and D. F. Mott. 1973. Bird damage to ripening field corn in the United States, 1971. U.S. Dept. Int., Fish and Wildl. Serv., Wildl. Leafl. 505. 8 pp.

Thompson, R. D., and C. V. Grant. 1968. Nutritive value of two laboratory diets for starlings. Anim. Care 18:75-79.

Whitney, N. J. 1954. Ear rots in hybrid corn in Essex County, Ontario, in relation to damage by birds. Plant Disease Reporter 38(6):384-387.

Williams, R. E., and W. B. Jackson. 1981. Dietary comparisons of red-winged blackbirds, brown-headed cowbirds, and European starlings in north-central Ohio. Ohio J. Sci. 81(5):217-225.

Woronecki, P. P., R. A. Stehn, and R. A. Dolbeer. 1980. Compensatory response of maturing corn kernels following simulated damage by birds. J. Appl. Ecol. 17:737-746.

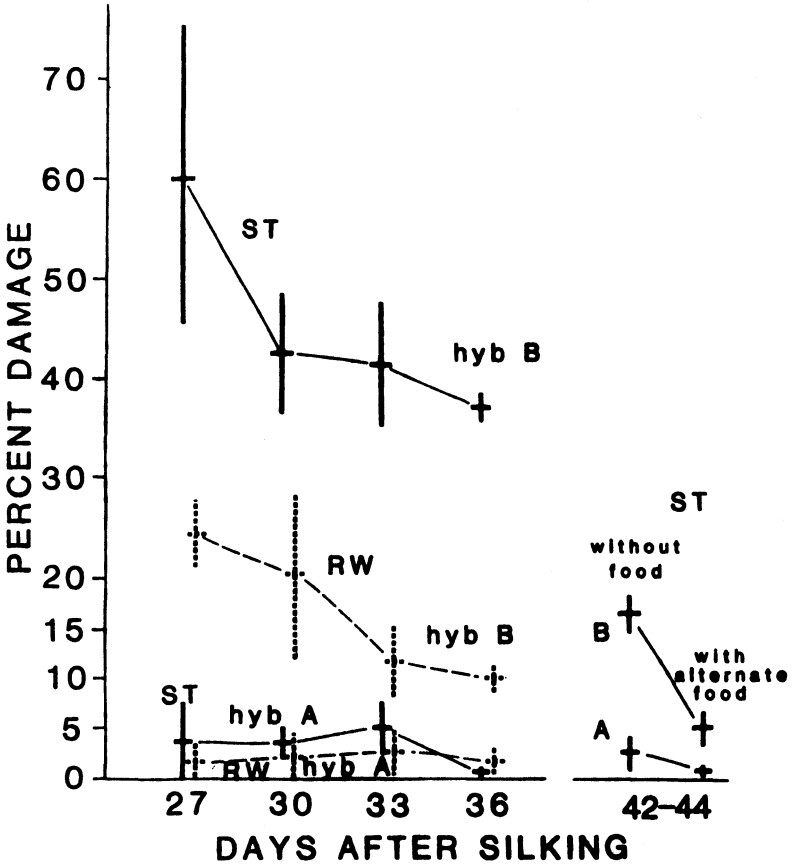

FIGURE 1. **Mean percent damage (± S.E.) for 2 hybrids (A and B) of field corn in relation to corn maturity (days after silking) by starlings (ST) and red-winged blackbirds (RW) using a free-choice evaluation in an aviary, 1982. Each data point represents the mean % damage for four ears of a hybrid in each of three cages.**