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# REFLECTING TAPE FAILS TO PROTECT RIPENING BLUEBERRIES FROM BIRD DAMAGE

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Bird-Scaring Reflecting Tape® (reference to trade names does not imply endorsement by Cornell Univ. or U.S. Gov.), a synthetic resin film made of mylar, has shown promise for repelling depredating birds from agricultural crops (Bruggers et al. 1986, Dolbeer et al. 1986). The tape is 11 mm wide, 0.025 mm thick, and metallic red and silver on opposite sides. When suspended over a crop, it reflects sunlight and, under windy conditions, pulsates and produces a humming sound. Bird-Scaring Reflecting Tape has been used to reduce damage to sunflowers, millet, maize, and sorghum in the United States, Bangladesh, Philippines, and India (Bruggers et al. 1986, Dolbeer et al. 1986). However, no published accounts have reported its use for protecting ripening fruit crops. The objective of this study was to determine whether Bird-Scaring Reflecting Tape would protect ripening blueberries from damage by birds.

## STUDY AREA AND METHODS

We conducted the study during 1986 at 3 locations in the mid-Hudson Valley of New York: Wollerton's farm in Columbia County, Borchert's farm in Ulster County, and Greig's farm in Dutchess County. The Wollerton site contained 10 rows of 0.7–1.0-m-tall, 2-year-old highbush blueberries encompassing 0.2 ha and surrounded on 2 sides by mixed hardwood trees. The Borchert site contained 7 rows of 3-year-old highbush blueberries 0.8–1.0 m tall, encompassing 0.2 ha. Blueberries were bordered on 2 ends by hardwood trees, on 1 side by row crops, and on the other side by a 1-year-old apple orchard. The site at Greig's farm contained 0.5 ha of blueberries which were contiguous on 2 sides with a 6-ha planting of blueberries. The plot consisted of 10 rows of 7- and 8-year-old highbush blueberries, 1.0–1.5 m tall.

We divided each site into 2 equal plots and randomly selected 1 plot for initial treatment with Bird-Scaring Reflecting Tape. We suspended the tape in parallel strips 0.5–1.0 m above each row of blueberries on the plot selected for treatment and used the alternate plot as a control. We initially erected the reflecting tape when the berries turned pinkish, before any bird damage occurred, at Borchert and Wollerton on 19 June and at Greig on 27 June. Ten days after the start of the study, we reversed the treatments on the 2 halves of each site.

Strips of reflecting tape were 27–44 m long and 3.0 m apart at Wollerton, 43–49 m long and 3.7 m apart at Borchert, and 61–83 m long and 3.5 m apart at Greig. At the first 2 sites we suspended the tape between 2 1.5-m-tall wooden stakes. The tape at Greig's farm was supported at the ends and the middle by 2.5-m-tall metal poles. To reduce tape breakage at the poles, we wrapped reinforced strapping tape around 0.25 m at each end of the tape before tying it to the poles. We twisted the tape 5–6 times/40 m and allowed enough slack for it to undulate 1–3 m in the center. To discourage birds from flying under the tape at the edges of the field, we suspended an additional strip of tape 1 m aboveground around the perimeter of the Wollerton and Borchert plots. We did not suspend additional tape at Greig because we never saw birds fly low into this plot.

We estimated bird damage by counting the number of blueberries damaged or missing from portions of 50 bushes selected at random from each plot. Orange surveying tape was used to mark off an end segment of a branch on a randomly selected side of each sample bush. Berries on these premarked branches were counted 10–12 days after tapes were installed, when berries first began to receive damage, and then again 10 and 20 days later. We assumed birds were the cause of all damaged or missing berries. Percent damage for each 10-day interval was calculated on the basis of the number of undamaged berries present at the beginning of that assessment period.

Table 1. Blueberries damaged by birds on plots with and without Bird-Scaring Reflecting Tape in the mid-Hudson Valley of New York, 1986.

| | Test site | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Wollerton | | Borchert | | Greig | | Total[a] | |
| | Days[b] | | Days | | Days | | Days | |
| Treatment | 1–10 | 11–20 | 1–10 | 11–20 | 1–10 | 11–20 | 1–10 | 11–20 |
| Plot with tape | 6.3[c] | 77.9 | 55.9 | 90.3 | 2.2 | 1.9 | 21.5 | 56.7 |
| Plot without tape | 20.3 | 48.8 | 44.6 | 91.5 | 1.2 | 6.9 | 22.0 | 49.1 |

[a] There were no differences ($P > 0.70$) in mean damage between the 2 treatments for either 10-day period.
[b] Study was conducted for 2 consecutive 10-day periods. Treatments were switched at the end of the first 10-day period.
[c] Average percentage of blueberries damaged on 50 plants in each plot.

We conducted 10 bird counts at each site, 5 during each 10-day assessment period. All counts were conducted within 4 hours of sunrise. During each count, the 2 halves of the site were watched for 30 minutes each, and the species and numbers of birds entering were recorded. We randomly determined the order in which the 2 halves were watched.

At the beginning of the test, approximately 50 berries were marked for observation for each sample bush, but during the second assessment period the number of berries evaluated per bush varied. Because of these unequal sample sizes, we analyzed data separately for the 2 halves of the test. We used an arcsine square root transformation for damage data and a square root transformation for bird-count data before conducting analyses of variance (Snedecor and Cochran 1980).

## RESULTS

The average percentage of berries damaged or removed during the first 10 days of the test was 21.5% on treatment plots versus 22.0% on control plots ($F = 0.044$; 1,2 df; $P = 0.846$) (Table 1). During the second 10 days of the test, after treatments were switched, the average percentage of blueberries damaged on treatment and control plots was 56.7 and 49.1%, respectively ($F = 0.159$; 1,2 df; $P = 0.723$).

During the 0.5-hour bird counts for the first 10 days, an average of 9.9 birds flew into treatment plots versus an average of 8.9 birds that flew into control plots ($F = 0.0005$; 1,2 df; $P = 0.949$) (Table 2). The averages for American robins (*Turdus migratorius*) for the first 10 days were 6.6 birds for treatment plots and 5.5 for control plots ($F = 0.497$; 1,2 df; $P = 0.554$). During the latter half of the test, we recorded an average of 9.8 birds of all species flying into treatment plots and 9.4 birds flying into control plots ($F = 0.781$; 1,2 df; $P = 0.529$). For robins, 6.2 and 4.1 birds, respectively, flew into plots with and without the Bird-Scaring Reflecting Tape ($F = 0.202$; 1,2 df; $P = 0.693$).

We saw no apparent deterrent effect from the tape on the behavior of birds. European starlings (*Sturnus vulgaris*), American robins, house finches (*Carpodacus mexicanus*), northern mockingbirds, (*Mimus polyglottus*), and gray catbirds (*Dumetella carolinensis*) flew between strands of tape frequently and with no apparent hesitation. Many birds perched momentarily on the tape before dropping into the field. We observed birds land on the tape: starlings on 24 occasions, house finches on 3 occasions, and robins, mockingbirds, and catbirds on 1 occasion each.

## DISCUSSION

Reflecting tape apparently did not deter birds from eating blueberries or from flying into taped plots. There was no buffer between treated and control plots, and so any inhibitory effect of the tape may have extended to the entire field, thus reducing any differences between the 2 plots. However, although our sample of only 3 fields was small, the high levels of damage on the plots with tape, together with our observations of birds reacting to the tape, convinced us that Bird-Scaring Reflecting Tape is not an effective bird deterrent under the conditions evaluated in this study.

Because we employed tape 10–12 days be-

Table 2. Average number of birds that flew into blueberry plots with and without Bird-Scaring Reflecting Tape during each of 5 0.5-hour bird counts in the mid-Hudson Valley of New York, 1986.

| | | Test site | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Wollerton | | Borchert | | Greig | | Total[a] | |
| | | Days[b] | | Days | | Days | | Days | |
| Treatment | Birds | 1–10 | 11–20 | 1–10 | 11–20 | 1–10 | 11–20 | 1–10 | 11–20 |
| Plot with tape | Robin | 7.5 | 15.2 | 9.4 | 1.8 | 3.0 | 1.7 | 6.6 | 6.2 |
| | Starling | 0 | 0 | 3.9 | 3.2 | 0 | 0 | 1.3 | 1.1 |
| | House finch | 0 | 0.2 | 0 | 0 | 0.3 | 2.4 | 0.1 | 0.9 |
| | All species[c] | 7.5 | 15.9 | 15.9 | 7.1 | 6.2 | 6.5 | 9.9 | 9.8 |
| Plot without tape | Robin | 12.1 | 9.3 | 4.3 | 2.2 | 0.1 | 0.9 | 5.5 | 4.1 |
| | Starling | 0 | 0 | 7.4 | 2.1 | 0 | 0 | 2.5 | 0.7 |
| | House finch | 1.0 | 0.2 | 1.2 | 0.5 | 2.3 | 0.4 | 1.5 | 0.4 |
| | All species | 13.8 | 10.7 | 10.2 | 14.4 | 2.7 | 3.0 | 8.9 | 9.4 |

[a] There were no differences ($P > 0.50$) in the mean number of either robins or birds of all species between the 2 treatments for either 10-day period.
[b] Study was conducted for 2 consecutive 10-day periods. Treatments were switched at the end of the first 10-day period.
[c] Other species included gray catbird, eastern kingbird (*Tyrannus tyrannus*), northern mockingbird, common grackle (*Quiscalus quiscula*), blue jay (*Cyanocitta cristata*), northern cardinal (*Cardinalis cardinalis*), and evening grosbeak (*Coccothraustes vespertinus*).

fore the first berry and bird counts, birds may have become habituated to the tape by the time we started our observations. Birds usually habituate rapidly to propane exploders, electronic noise makers, kite-hawk models, and other nonlethal frightening devices (Spanier 1980, Hothem and DeHaven 1982, Conover 1985). We put the tape up early to discourage birds from visiting the study sites before the berries began to ripen. Blueberries within a field ripen asynchronously and are susceptible to bird damage for ≥3–4 weeks. Thus, even if birds initially were inhibited during the period when we did not measure bird activity, it is doubtful whether delaying putting up the tape for a few days would have improved protection substantially for this long period of vulnerability.

Interspecific differences among birds may help explain the discrepancies between our results and those of other studies with Bird-Scaring Reflecting Tape. For grain crops, Dolbeer et al. (1986) found the tape most effective against red-winged blackbirds (*Agelaius phoeniceus*) and brown-headed cowbirds (*Molothrus ater*), species not present in our study. They also reported that mourning doves (*Zenaida macroura*) were influenced little by the tape. We frequently saw mourning doves foraging in taped fields, although apparently not on blueberries. Bruggers et al. (1986) also reported interspecific differences in reactions to the tape, although none of the species they found the tape effective against were present in our study. Robins, starlings, and house finches, the most common birds in our study, apparently are not deterred by the tape.

The degree to which birds associate in flocks may influence how they react to Bird-Scaring Reflecting Tape. Most of the birds studied by Dolbeer et al. (1986) and Bruggers et al. (1986) foraged in large flocks, and Dolbeer et al. (1986) suggested that the undulating movement, flashing, and sound of the tape may disrupt visual or auditory communication of birds trying to feed in cohesive flocks. Reflecting tape may be less effective against birds foraging singly or in small groups, such as the birds in our study.

The number and configuration of tape strands may affect their efficacy for deterring birds. Dolbeer et al. (1986) used 17–35 strands of tape perpendicular to the rows of plants to deter depredating blackbirds and cowbirds. The sites in our study had only 7–10 strands parallel to the rows of plants. A greater number of strands may produce a more impressive visual and auditory stimulus to birds, and a perpendicular arrangement may be more of a deterrent than a parallel one, because birds have to fly into a square and not a long row. However, neither of these options would be practical for most blueberry plantings, because people harvesting the berries must walk between the rows of plants.

The tape may be more effective for protecting shorter crops where birds have less room to maneuver under the tape. Growers in Washington reported using Bird-Scaring Reflecting Tape successfully on strawberries (M. Pitzler, U.S. Dep. Agric., pers. commun.). Further studies are needed to elucidate how birds react to the tape in various situations in order to determine its utility on other fruit crops.

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# REDUCING INJURIES TO TERRESTRIAL FURBEARERS BY USING PADDED FOOTHOLD TRAPS

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The standard foothold trap is used widely in North America as the most common means of harvesting many furbearers; >66% of all traps purchased in the United States are of this type (Woodstream Corp., Lititz, Pa.). In spite of the introduction of killing traps, such as the Conibear® (reference to trade names or com-

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