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REDUCING BIRD DAMAGE TO RIPENING CHERRIES WITH METHIOCARB

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REDUCING BIRD DAMAGE TO RIPENING CHERRIES WITH METHIOCARB

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Abstract: An experimental repellent, methiocarb (4-[methylthio]-3,5-xylyl *N*-methylcarbamate), was evaluated as a 0.16 percent spray treatment for reducing bird damage to ripening cherries in a sweet cherry (*Prunus avium*) orchard and a tart cherry (*P. mahaleb*) orchard in Michigan in 1971. Bird damage to untreated fruit was high (at harvest, over 45 percent in sweet cherries and over 50 percent in tart cherries). Robins (*Turdus migratorius*) and common grackles (*Quiscalus quiscula*) caused most of the damage to the sweet cherries; starlings (*Sturnus vulgaris*), to the tart cherries. In both orchards, bird damage at 6 days after methiocarb treatment was significantly less in treated than in untreated trees. At harvest (2 weeks after treatment), damage in treated trees was reduced 65.6 percent in the sweet cherry orchard and 62.2 percent in the tart cherry orchard; this reduction was highly significant ($P < 0.005$).

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Many species of birds damage ripening fruits throughout the United States and cause serious economic losses. Cherries are probably more extensively damaged than any other fruit crop.

In an unpublished questionnaire survey of bird damage in 144 randomly selected counties in the United States, birds were reported to damage cherries more frequently than any other agricultural crop except corn. This survey was conducted by the U.S. Department of Agriculture's Extension Service in cooperation with the U.S. Bureau of Sport Fisheries and Wildlife (1965). Damage to cherries was reported from 26 counties and about one-third of these considered it serious. In a questionnaire survey to leading horticulturists conducted by Meister (1968), damage to cherries by birds in one county in Michigan was reported to amount to $250,000.

Because estimates obtained from questionnaires lack precision, the Denver Wildlife Research Center and the Statistical Reporting Service of the U.S. Department of Agriculture obtained the first statewide quantitative information on the importance of bird damage to tart cherries in Michigan in 1972. The survey was based on counts of cherries on randomly chosen branches throughout Michigan's cherry-growing range, and it was estimated that birds could have consumed up to 17.4 percent of the crop (Stone 1974). Predicted production of tart cherries for Michigan in 1972 was 162,906 tons, so about 28,345 tons (worth close to $4.25 million) were lost. Because birds that damage fruits are often desirable species, nonlethal means must be found for reducing the damage they cause. One promising method is to treat ripening fruit with an effective chemical repellent.

In recent laboratory studies, an experimental compound, methiocarb, has shown excellent repellency for red-winged blackbirds (*Agelaius phoeniceus*) (Schafer and Brunton 1971). Field testing of this compound showed that it has successfully prevented several species of birds from pulling sprouting corn in South Dakota (West et al. 1969), in Texas (West and Dunks 1969), in New York (Guarino and Forbes 1970), and in South Carolina (Stickley and Guarino 1972); and reduced blackbird damage to

ripening rice in California (DeHaven et al. 1971). These results prompted our testing methiocarb on ripening cherries.

We thank W. J. Young and M. K. Hannah of the Plant Industry Division, Michigan Department of Agriculture, W. E. Heuser of the Hilltop Orchard for providing test sites and spraying equipment, and Chemagro Division of Baychem Corporation for providing the chemical and analyzing samples for residues. R. N. Smith helped collect some of the data. A. H. Jones, J. F. Besser, D. F. Mott, and C. P. Stone reviewed the manuscript. C. P. Stone also provided assistance in statistical analysis.

PROCEDURES

Test Sites

The tests were conducted in two cherry orchards in Michigan from mid-June to cherry harvest time in early July 1971. One test site at the Hilltop Orchard near Hartford consisted of a row of 17 sweet cherry trees of the Mazzard variety (*P. avium*), which averaged about 25 feet in height. This variety is the root stock for most sweet cherry trees. These trees were surrounded by about 1.5 acres (0.6 hectare) of European wild tart cherry trees, whose fruit matured about 2 weeks later. The European variety is the root stock for most tart cherries. The other test site at Michigan State University's Agricultural Experiment Station at Lansing consisted of a rectangular block of about 0.5 acre (0.2 hectare) of 22 tart cherry trees averaging 15 feet (4.6 m) in height. At both sites the cherries were harvested for seed and not for human consumption.

Treatment

After a series of repellent tests, Griffin and Baumgartner (1959) concluded that "a large area made up entirely of treated plots was more effective in repelling birds than a comparable-sized area of small plots interspersed with controls." This concept was confirmed by the results obtained by West et al. (1969) in tests with methiocarb on seed corn in South Dakota and by DeHaven et al. (1971) in tests with methiocarb sprayed on ripening rice in California. Therefore, to provide a block effect and to have treated areas as large as possible, each site was divided in half and one of the halves selected at random for treatment. All trees in the treated half were sprayed until they were dripping wet with a water formulation of 0.16 percent methiocarb 75 percent wettable powder and 0.05 percent Dow Latex 512R (reference to trade names does not imply endorsement of commercial products by the Federal Government). An application rate of 1 lb (454 grams) active methiocarb/100 gallons (379 liters) of water was used. This rate was chosen because the manufacturer of methiocarb (Chemagro Division of Baychem Corporation, Kansas City, Missouri) has found that this compound has potential as an insecticide when applied to fruit at this concentration. The product was tested on apples and pears in 1972 under an Environmental Protection Agency temporary permit and a temporary tolerance of 7 ppm in these fruits has been granted under this permit.

Forty-five gallons (170 liters) of spray was applied to the sweet cherry trees at Hilltop on 22 June with a low pressure mist blower, and the same amount to the tart cherry trees at Lansing on 24 June with a nozzle-type pressure sprayer. The tart cherries were re-treated on 6 July because about 1.25 inches (3.2 cm) of rain had fallen since the first treatment.

Evaluation

Damage was assessed by comparing the number of cherries lost to birds on a sample

Table 1. Loss of cherries to birds in two orchards sprayed with 0.16 percent methiocarb (tart cherry orchard treated a second time 2 days before harvest).

Time of evaluation	Type of cherry	Number of cherries checked		Percent cherries damaged or missing			
				By treatment		By height	
		Untreated trees	Treated trees	Untreated trees	Treated trees	On upper ½ of all trees	On lower ½ of all trees
6 days after treatment	Sweet	1663	1583	19.1	4.6*	15.0	9.0
	Tart	2760	2750	19.8	4.1*	16.6	7.4**
At harvest	Sweet	1663	1583	46.1	15.9*	36.3	26.4
	Tart	2760	2750	52.6	19.9*	45.1	27.5*

* $P < 0.005$.
** $P < 0.025$.

of four treated and four untreated of the 17 sweet cherry trees and seven treated and seven untreated of the 22 tart cherry trees. Two treated and two untreated trees at the center of the sweet cherry orchard, and four treated and four untreated trees at the center of the tart cherry orchard were excluded from the evaluation to minimize any possible side-by-side effects of treated and untreated trees. One treated and four untreated trees were also excluded in the sweet cherry orchard because of poor fruit production.

Before the first treatments, approximately 50 cherries on the tips of each of eight randomly selected branches in each sample tree were counted, and this point on the branch was marked off with colored tape. The branches were stratified to determine possible height and directional effects: two were randomly selected for each compass direction (N, S, E, and W), with one above and one below the midpoint of each tree.

The number of remaining cherries and the number of cherries that birds had damaged or removed (leaving only the stem) were counted on each sample branch 6 and 15 days after treatment in the sweet cherry orchard, and 6 and 14 days after the first treatment (2 days after the second treatment) in the tart cherry orchard. Because of counting errors, we ended up with samples of 1663 untreated and 1583 treated sweet cherries instead of the 1600 we sought, and 2760 untreated and 2750 treated tart cherries instead of 2800. These figures were used in analyzing the data (Table 1). All bird-pecked cherries and stems with missing cherries were removed after the first evaluation.

A bird census was made whenever possible on line transects through the study area between daylight and 0900 and between 1500 and dusk. Damage to fruit crops by robins is most pronounced during these periods (Smith 1966).

About ½ lb (227 grams) of cherries, collected at random from treated and untreated trees in both orchards, was frozen and shipped to Chemagro Division of Baychem Corporation for residue analysis. Sweet cherry samples were collected just before harvest (15 days after treatment). Tart cherry samples were collected the day of the first treatment, just before the second treatment, and just before harvest (2 days after the second treatment).

Analysis of variance was used to analyze arcsin-transformed data for treatment, directional, and height effects.

RESULTS AND DISCUSSION

Damage Reduction

The methiocarb treatments resulted in highly significant damage reductions in

both orchards (Table 1). Treatment effects were already evident in the first evaluation, 6 days after treatment. At harvest, damage was reduced by 65.6 percent in the sweet cherry orchard and 62.2 percent in the tart cherry orchard. These results are comparable with those from other tests with methiocarb. For sprouting corn, damage caused by various species of birds was reduced by 97 percent (West et al. 1969), by 70 percent (West and Dunks 1969), by 71 to 83 percent (Guarino and Forbes 1970), and by more than 99 percent (Stickley and Guarino 1972); and damage to ripening rice caused by blackbirds was reduced by as much as 90 percent (DeHaven et al. 1971).

Differences in damage due to height (upper vs. lower halves of all trees) were not significant in the sweet cherry orchard but were highly significant in both evaluations in the tart cherry orchard (Table 1). The heavier damage in the tops of the tart cherry trees was probably caused partly by earlier ripening of the cherries there; the ripening process gradually works downward, and fruit higher in the tree would be vulnerable to birds for longer periods. Also, starlings were the most numerous birds in the tart cherry orchard and spent most of their feeding time in the upper parts of trees, even when the lower cherries had ripened. In the sweet cherry orchard, two less wary species, robins and common grackles, were the most numerous, and we suspect that they began to feed heavily in the lower parts of the trees as the cherries there ripened.

There were no significant differences ($P > 0.10$) in damage due to compass direction or to height and direction interactions in either evaluation made in either orchard, but a significant difference ($P < 0.005$) in damage did occur in treatment and height interactions in the final evaluation in the sweet cherry orchard. Compared with unsprayed trees, treated trees probably suffered proportionately less damage in the lower halves than in the top halves. We believe that methiocarb has a different repellent effect on different bird species, and that robins, which spend considerable time in lower branches, may have been repelled the most.

Damage was caused primarily by local breeding birds and their young, and censuses indicated that bird numbers were fairly constant throughout the study. An accurate estimate of the species and numbers involved was difficult to make because of the dense canopy in the orchards. Unfortunately, pretreatment population data are lacking. Damage was already occurring in the sweet cherry orchard when it was treated. Birds did not begin to feed in the tart cherry orchard until 5 days after it was sprayed; however, it appeared that the treated and control areas in both orchards were equally susceptible to bird pressure.

Most birds spent most of their time feeding in untreated trees in both orchards. In 17 counts made in the sweet cherry orchard, 236 birds of 12 different species were observed; 193 birds were in the untreated trees and only 43 in the treated. About 40 percent were grackles and 30 percent robins. In 12 counts in the tart cherry orchard, 70 starlings and 3 grackles were observed; 58 were in untreated trees and only 15 in treated.

In the sweet cherry orchard, the highest single count of birds in the untreated trees was 12 robins, 11 common grackles, 6 red-winged blackbirds, 4 starlings, 3 rose-breasted grosbeaks (*Pheucticus ludovicianus*), 3 red-headed woodpeckers (*Melanerpes erythrocephalus*), 2 cedar waxwings (*Bombycilla cedrorum*), 2 Baltimore orioles (*Icterus galbula*), 1 brown thrasher (*Toxostoma rufum*), 1 catbird (*Dumetella caro-*

linensis), 1 blue jay (*Cyanocitta cristata*), and 1 yellow-shafted flicker (*Colaptes auratus*). The highest single count in the treated trees was 10 grackles, 3 rose-breasted grosbeaks, 2 robins, 2 starlings, 1 yellow-shafted flicker, and 1 red-winged blackbird. All but the catbirds and red-winged blackbirds were seen eating cherries. In the tart cherry orchard, the highest single count in the untreated trees was 34 starlings and 1 common grackle, and in the treated trees, 12 starlings and 2 common grackles; however, on several occasions a flock of about 75 starlings was seen in adjacent trees, and we suspect that they also fed in this orchard.

Residues

Methiocarb residues in the pulp of sweet cherries averaged a surprisingly low 1.23 ppm 15 days after treatment. These residues are well below the 7 ppm tolerance currently being sought by the manufacturer for methiocarb as an insecticide on apples and pears.

In contrast, methiocarb residues in the pulp of tart cherries were very high, chiefly because the variety grown for seed to establish root stock seedlings has very small fruit with very little pulp. These cherries contained 39.91 ppm 12 days after the first treatment, and 46.81 ppm at harvest, 2 days after the second treatment. The spray applied in the tart cherry orchard resulted in a very large droplet forming at the bottom of each cherry, which possibly contributed to the high residues.

CONCLUSIONS

It was encouraging that cherries could be protected against bird damage by insecticidal levels of methiocarb. This indicates that treating cherries with methiocarb for insect control will provide a bonus of bird protection if the schedule of treatment for insects coincides with or overlaps the time period when bird damage occurs. This should help to greatly decrease costs in developing and registering this chemical for reducing bird damage because most of the data needed for registration at this application rate are now being gathered for its intended insecticidal uses.

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