

Recovery of Soybean Cyst Nematodes (*Heterodera glycines*) from the Digestive Tracts of Blackbirds

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Abstract: Digestive tract contents and feces of blackbirds were examined for cysts of *Heterodera glycines*, the soybean cyst nematode. Birds fed under laboratory conditions and trapped in naturally-infested fields were checked. Infective larvae were recovered from cysts in the excrement of birds 24 and 48 hr after they were fed cysts. Birds that were force-fed eggs and larvae discharged infective larvae in the excrement. Birds which consumed cysts mixed with feed and cysts in feed mixed with soil discharged numerous cysts containing infective larvae. Seven of 54 starlings, trapped and killed in an infested field, contained cysts in their digestive tracts. **Key Words:** Excrement, Cysts.

Birds may spread the soybean cyst nematode from infested to non-infested areas. Migratory and non-migratory birds visit many fields in search of food and are known to feed in fields infested with soybean cyst nematodes, *Heterodera glycines* Ichinohe. Some species of blackbirds in Tennessee have a common roosting site which may be many miles from their feeding grounds. They leave the roosting sites soon after daybreak each morning, fly in many directions, and return late in the day. In West Tennessee, roosting sites are inside the city limits of Jackson, near Milan, and near Hickory Valley.

Smart (1) found that soybean cyst nematodes may survive passage through the digestive tract of swine. Thorne (2) suggested that ducks, geese, and gulls, may spread nematodes as they stop to feed during migration.

The series of tests reported here were conducted to determine whether *H. glycines* cysts, eggs, and larvae survived passage through the digestive tract of blackbirds, and whether cysts were present in the digestive tracts of blackbirds trapped in a field infested with the soybean cyst nematode.

MATERIALS AND METHODS

Three species of blackbirds (i) brown-headed cowbird (*Molothrus ater*), (ii) grackle (*Quiscalus quiscula*), and (iii) starling (*Sturnis vulgaris*) were used in the studies. Each species was caged separately, 6–12 birds per cage, and maintained for 6–8 days on crushed corn and milo seed before the test feedings were started. They had access to feed and water at all times before and during the test period. The four tests were conducted in January and February.

In Test 1 birds of each species in one cage were force-fed, from a medicine dropper, 300–400 cysts averaging 375 eggs per cyst. Pans of water were placed under the perches to collect the excrement. Twenty-four and 48 hr after feeding, the contents of the pans were passed through 20 and 80-mesh sieves, and material from the 80-mesh sieve was examined for cysts. Recovered cysts from the 80-mesh sieve were crushed in watch glasses and examined to determine viability. All eggs and larvae from the crushed cysts were rated for infectivity on roots of 'Lee' soybeans. The crushed cysts were placed around the roots of week-old plants and grown for 30 days in 10-cm pots containing autoclaved sandy-loam soil. Tests 2 and 3 were similar except birds were fed approxi-

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TABLE 1. Recovery and infectivity of soybean cyst nematodes after passage through the digestive tract of blackbirds.

Material ingested	Post-feeding cyst recovery		Soybean bioassay
	0-24 hours	24-48 hours	30 days after inoculation
300-400 cysts/bird	85 cysts	60 cysts	75 - 100 females/plant
Cysts in feed	33 "	115 "	100+ "
Cyst-infested soil in feed	15 "	39 "	20 - 40 "
Eggs and larvae	300 eggs & larvae	150 eggs & larvae	10 - 20 "

mately 5000 cysts mixed with crushed corn and milo, or small pans of sandy-loam soil containing 5000 cysts were mixed with the feed (test 3). In the Test 4 approximately 10,000 eggs and larvae were force-fed to each bird by medicine dropper. Excrement was collected and sieved 24 and 48 hr after feeding, and material from a 325-mesh sieve was examined for presence of eggs and live larvae. The washings were placed around the roots of soybean plants.

Fifty-four starlings were trapped in a field heavily infested with soybean cyst nematodes from a previous crop of 'Lee' soybeans. Soil (500cc) from the field assayed 300 to 500 cysts, with an average of 350 eggs per cyst. The birds were sacrificed, and the content of each digestive tract was washed through a 20-mesh and an 80-mesh sieve. The material on the 80-mesh sieve was examined and the recovered cysts were crushed and placed around the roots of young soybean plants.

RESULTS

The results of the bird feeding studies are recorded in Table 1. Cysts were recovered, at both the 24- and 48-hr interval, in all cases where cysts were fed to the birds. Eggs and larvae were recovered at 24 and 48 hr when eggs and larvae were fed to the birds. In all cases larvae from the material recovered from the excrement penetrated and reproduced on 'Lee' soybeans.

One to three cysts were recovered from the digestive tracts of 7 of 54 birds. Twenty percent of the cysts were empty, but some of the cysts contained viable eggs, and larvae hatched from these eggs penetrated and reproduced on 'Lee' soybeans.

DISCUSSION

These experiments showed that cysts, eggs, and larvae of the soybean cyst nematode can pass through the digestive tract of three kinds of blackbirds and remain capable of infecting soybeans. Both migratory and non-migratory birds feed in infested soybean fields and move freely from field to field; after feeding, some fly many miles to roosting sites, and some migrate long distances. My findings indicate that it is possible and probable that birds spread soybean cyst nematodes to non-infested fields. How far they spread the nematode may depend on the kind of bird, their feeding habits, and place of feeding. Recovery of nematodes 24-48 hr after feeding indicates that the soybean cyst nematode can remain in the digestive tract of birds long enough to be carried for considerable distances. Since viable nematodes were recovered from birds under field conditions, large numbers of cysts can be ingested and later spread in feces from flocks of several thousand birds while feeding in infested fields.

I propose that migratory birds are a means

of spreading soybean cyst nematodes for both short and long distances. It is quite possible that birds were responsible for the spread and subsequent discovery of the soybean cyst nematode in Louisiana, Florida, Indiana, and other widely separated places. There appears to be more spread in a North-South than in a East-West pattern. This nematode has a range from North of St. Louis, Missouri to North Florida. They have not spread as much to the East or West. This

might be related to the Mississippi wild fowl flyway.

LITERATURE CITED

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