WIREWORM CONTROL in CORN

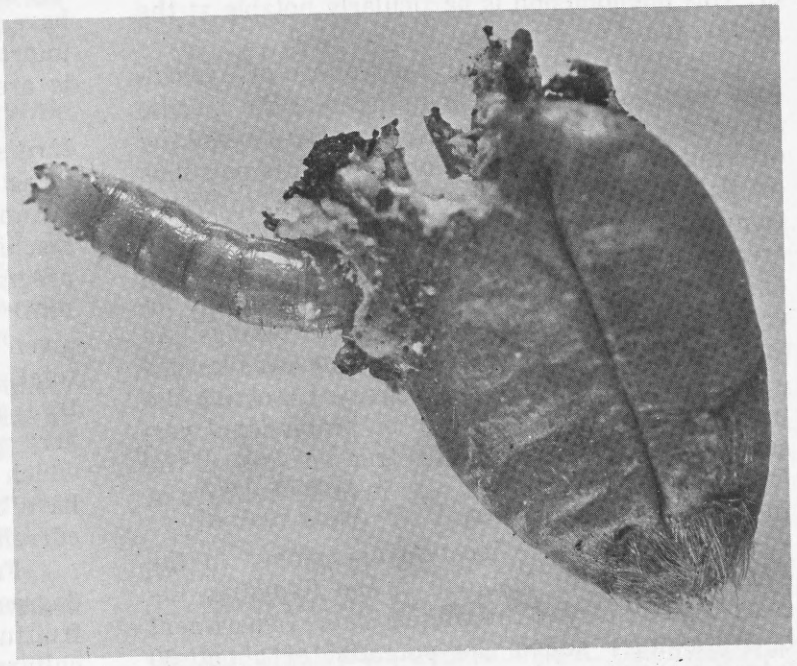

Fig. 1. Wireworms damage grain seed.

Dean K. McBride

Wireworms are one of the most common problem insects in North Dakota corn and small grain production. Many growers are convinced that insecticidal treatment helps prevent seed damage. Unfortunately, seed treatments will not prevent seedling damage (see Figure 2), which is very prevalent when soil moisture is abundant early in the growing season. So long as moisture is adequate in a wireworm-infested field, they will remain near the surface to feed.

Wireworm control trials in corn were initiated in 1970 at two field locations in northern Ransom county. These fields were located on the northern edge of what is commonly referred to as the sandhills area where a sandy loam is the general soil type. Several insecticides to prevent wireworm damage to corn seeds and seedlings were evaluated in the trials. Selected fields were ideal for wireworm control trials since a definite level of wireworm infestation (1-2 per square foot) could be established in both fields. Since wireworms are soil inhabiting insects, it is often difficult to obtain an accurate survey of population levels.

To obtain additional data on wireworm control in corn, field trials were continued in 1971 to further evaluate insecticidal compounds tested in 1970 and to examine several additional compounds. The insecticides used in the 1970-71 wireworm trials were all unregistered for use as band applications in wireworm control with the exception of Aldrin and Belt.

McBride is extension entomologist, North Dakota State University.

Two field locations were selected in 1971 for testing. One corn field of about 40 acres is located on the Roger McDonald farm, four miles southeast of Leonard, North Dakota. The other field is located on the Gerald Thompson farm, six miles west and five miles south of Colfax, North Dakota. Insecticidal treatments and field plot design used on the Thompson farm are not presented, since the wireworm population in this field was too low to critically evaluate the test compounds.

On the McDonald farm, wireworm counts averaged one wireworm per square foot soil sample in certain areas of the field. Corn stand counts were taken in these areas.

Samples of wireworms found in control plots in 1970 and 1971 were collected and preserved in 80% alcohol. The specimens were determined by Dr. T. J. Spilman of the Plant Pest Survey and Detection Division of USDA as **Melanotus communis,** a common infestor of corn and tobacco.

Materials and Methods (1970 field tests)

Major emphasis was given to testing three granular insecticides on a 30-acre field of corn located on the Glenn Anderson farm, about eight miles east of Sheldon, North Dakota. Aldrin, DiSyston and Thimet granular insecticides were applied as band treatments at planting time in this field, with principle emphasis given to Thimet. Another insecticide, Cytrolane, was also included in this test. However, due to the potential phytotoxicity with this compound, it was applied only to six rows of corn in block three. Thus statistical data on this chemical is not presented.

Applications were made with a four-row corn planter with granular applicators mounted in front of the press wheel. All applications, with the exception of Thimet ½ and 1-pound in the seed furrow, were six-inch band treatments over the row with a 36-inch planter row spacing. Seeding rate in this field was 20,000 kernels per acre.

Treatments were applied in a random block design with a total of three blocks. Several of the treatments, notably Thimet 15G (1-lb. band) and Thimet 15G (2-lb. band) were replicated more than once within each block.

Thimet applications were made in eight-row treatments, DiSyston six rows, Aldrin six rows, and the checks were two rows.

At the other field location, Thimet 6-pound liquid concentrate was applied at broadcast rates of two, four and eight pounds actual per acre and Aldrin 2-pound EC was applied at the broadcast rate of two pounds actual per acre. These treatments involved about four acres of corn located on the George Petrich farm, about six miles east of Sheldon, North Dakota.

Fig. 2. Wireworms damage corn seedlings by tunneling into below-ground portion of the stem.

Table 1 gives the rates, methods of application and location for the insecticide treatments tested in 1970.

Table 1. 1970 Corn Insecticide Treatments Applied in Replicated Wireworm Control Trials.

Insecticide	Rate[1]	Application	Location
Thimet 15G	1	Banded	Glenn Anderson Farm
Thimet 15G	2	Banded	" " "
DiSyston 15G	2	Banded	" " "
Aldrin 20G	1	Banded	" " "
Thimet LC	2	Broadcast	George Petrich Farm
Thimet LC	4	Broadcast	" " "
Thimet LC	8	Broadcast	" " "
Aldrin EC	2	Broadcast	" " "
Thimet 15G	2.66	Broadcast	" " "
Aldrin 20G	1.33	Broadcast	" " "

[1] pounds of actual material per acre.

Numbers given for each treatment in each block in Table 2 denote the number of corn plants for each two two-rod rows taken in the middle two rows of each treatment. In other words, a total of 66 feet of corn row was counted for each of the treatments and checks. Treatments having a higher number of plants indicate a greater degree of protection against wireworm damage.

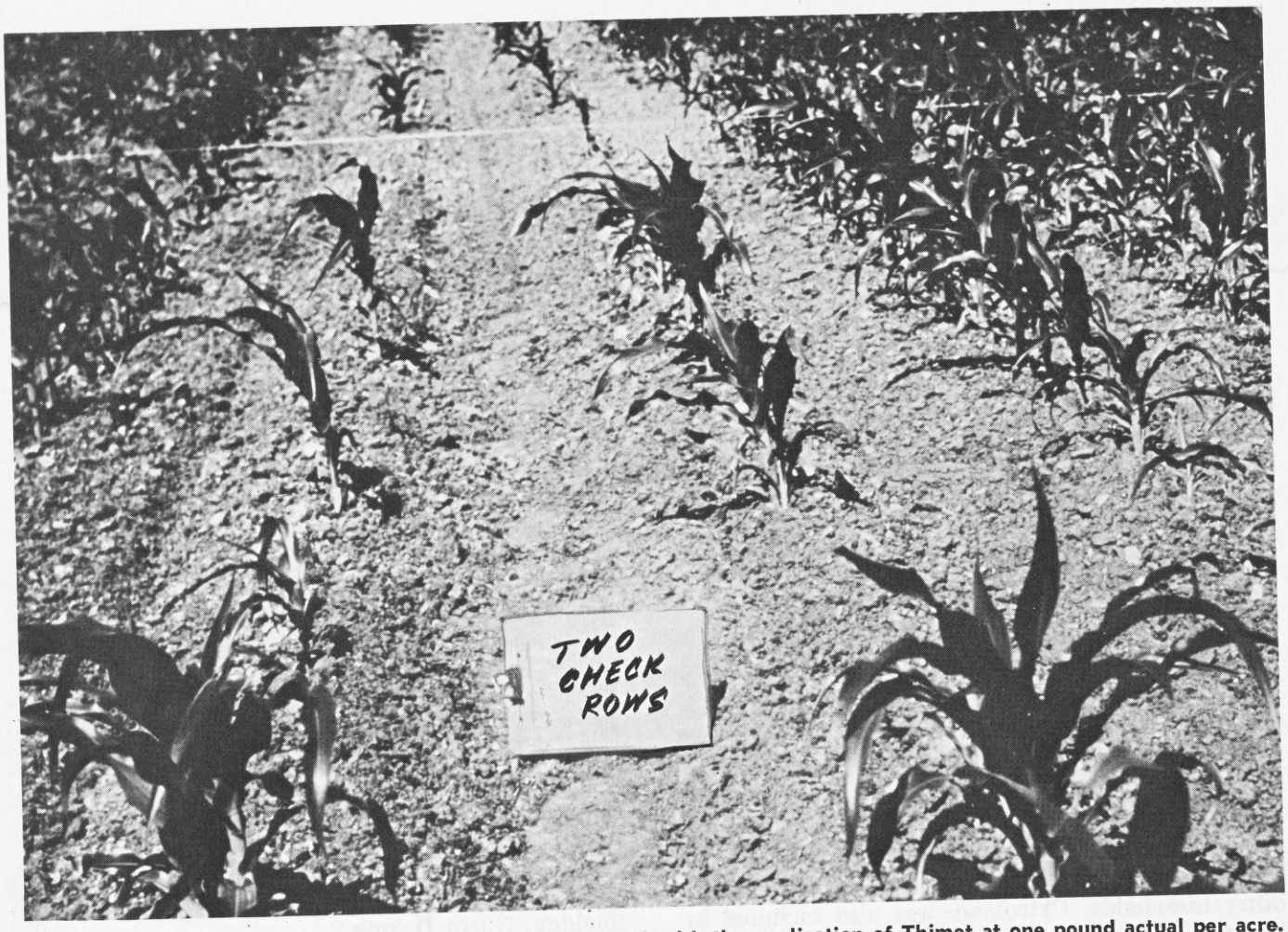

Fig. 3. The most favorable chemical treatment was attained with the application of Thimet at one pound actual per acre. Results can be seen at the right of the two check rows.

Table 2 gives the stand counts for each of the treatments and checks and also the averages.

Table 2. 1970 Wireworm Control Trials on Corn With Banded Granular Insecticides on Glenn Anderson farm, Sheldon, North Dakota.

Treatment	Block Nos. I	II	III	Plants/66 feet of row Total	Average	Range Test*
1. Thimet 15G 1 lb.	84	71	72	227	75.7	—
2. Thimet 15G 1 lb.	88	58	64	210	70.0	
3. Thimet 15G 2 lb.	61	59	72	192	64.0	—
4. Aldrin 20G 1 lb.	66	50	61	177	59.0	
5. DiSyston 15G 2 lb.	64	39	68	171	57.0	
6. Check	51	35	32	118	39.3	—
7. Check	52	20	36	108	36.0	—

* Any two means connected by the same line are not significantly different at the 95% level of confidence. (Analyzed by using Duncans multiple range test.) Treatments 1 and 2 differ significantly from treatments 3, 4, 5 and the checks.

Results of Insecticidal Broadcast Application on the George Petrich Farm

Broadcast applications of Thimet L.C. at rates of two, four and eight pounds actual per acre were made, as well as a broadcast application of Aldrin two pounds EC at the rate of two pounds actual per acre. The applications were made with a pickup truck-mounted sprayer, with spray booms extending 20 feet on each side of the back end. The entire swath width covered was 50 feet. (Note: Thimet is a highly toxic insecticide in the L.C. (liquid) formulation. It is not registered for application in the manner previously described.)

All broadcast applications were made on June 2, 1970. The chemicals were disked into the upper 4-8 inches of soil immediately after application. It was interesting to note that about 10 rows of corn planted several weeks earlier were sprayed at the two-pound rate but due to the fact that the chemical was not disked in, this corn was severely damaged by wireworms. Corn planted in the two-pound Thimet treated and disked soil adjacent to this sustained little if any detectable damage.

The total area treated with the previous named chemicals involved only about four acres of corn

land. The treatments were not applied in such a way that the results could be analyzed statistically. However, the results of this trial were so dramatic that statistical analysis was not necessary to determine that there was a very marked difference between the treated rows and the check rows.

The seeding rate in this field was 26,000 kernels per acre.

Stand counts taken four weeks after planting revealed the following results:

Table 3. 1970 Wireworm Control Trials on Corn With Broadcast Liquid Insecticides on George Petrich farm, Sheldon, North Dakota.

Treatment	Stand Counts (per 33 feet of row)
Thimet LC 2lb./A.	47 - 61
Thimet LC 4lb./A.	57 - 63
Thimet LC 8lb./A.	55 - 59
Aldrin 2lb. EC 2lb./A.	62
Check	6 - 7

There appeared to be no difference in stand counts between the Thimet and Aldrin broadcast treatments.

In addition to the Thimet L.C. broadcast applications, applications of Thimet 15G and Aldrin 20G were made on two 50x75-foot plots with a Cyclone hand seeder. The rate of application for the Thimet 15G was 2.66 pounds actual per acre. The Aldrin 20G was applied at 1.33 pounds actual per acre.

Stand counts taken in these plots four weeks after planting are presented in Table 4.

Table 4. 1970 Wireworm Control Trials on Corn With Broadcast Granular Insecticides on George Petrich farm, Sheldon, North Dakota.

Treatment	Stand Counts (per 33 feet of row)
Thimet 15G 2.66 lbs./A	59 - 60
Aldrin 20G 1.33 lbs./A	38 - 49
Check	6 - 7

Materials and Methods (1971 field tests)

Seven different granular insecticides at selected rates were included in the wireworm control trial on the Roger McDonald farm (Table 5).

Treatments were applied in a randomized complete block design. All treatments were single row treatments applied in a six-inch band over the row at planting time. The checks were two rows. Gandy granular application equipment was used on an eight-row corn planter.

On June 23, stand counts were made to determine the extent of plant protection provided by each of the test compounds. The rows of corn were counted in the same area across all three blocks. Both check rows were counted in each replication. These checks were totaled and averaged as one row for comparisons.

Table 5 shows the corn stand counts for each treatment in three replicates. Also shown are the totals and averages for all treatments and the checks.

Summary and Conclusions

Results of the 1970 wireworm control trials indicate that Thimet 15G at the rate of one pound

Table 5. 1971 Wireworm Control Trials on Corn With Banded Granular Insecticides on R. J. McDonald farm, Leonard, North Dakota.

Insecticides	Rate per acre	Block Nos. I	II	III	Plants/3 rods of row Total	Mean	Range Test*
Belt 33G	2 lbs.	13	32	22	67	22.3	—
Dasanit 15G	1 lb.	22	19	38	79	26.3	—
Aldrin 20G	1 lb.	17	39	23	79	26.3	
Belt 33G	2 lbs.	19	35	26	80	26.7	
DiSyston 15G	2 lbs.	29	29	26	84	28.0	—
Check 3		27	26	32	85	28.3	
Check 2		35	23	31	89	29.7	
Check 1		20	39	30	89	29.7	
Aldrin 20G	1 lb.	24	37	28	89	29.7	
Diazinon 14G	1 lb.	25	29	35	89	29.7	
Dasanit 15G	2 lbs.	37	31	21	89	29.7	
Dyfonate 20G	2 lbs.	41	32	25	98	32.7	—
DiSyston 15G	3 lbs.	33	32	35	100	33.3	
Thimet 15G	2 lbs.	28	20	56	104	34.7	
Diazinon 14G	2 lbs.	47	34	28	109	36.3	—
Thimet 15G	1.5 lbs.	36	36	50	122	40.7	
Dyfonate 20G	1 lb.	42	33	48	123	41.0	—
Dyfonate 10G	2 lbs.	39	48	45	132	44.0	—
Thimet 15G	1 lb.	53	42	48	143	47.7	
Dyfonate 10G	1 lb.	38	55	50	143	47.7	—

*Any two means connected by the same line are not significantly different at the 95% level of confidence.

Thimet 15G at 1 lb./acre and Dyfonate 10G at 1 lb./acre are significantly different from the check and all chemical treatments above and including Dasanit 15G at 2 lbs./acre at the 5% level of probability. The only other detectable difference at the 5% level of probability is Dyfonate 10G at 2 lbs./acre from the first Belt 33G treatment at 2 lbs./acre (22.3 mean).

actual per acre gave acceptable wireworm control and corn seedling protection. This was further substantiated in the 1971 trial.

Aldrin 20G at the one pound rate and DiSyston 15G at the two pound rate were not significantly different from each other but were inferior to Thimet 15G at the one pound rate. This was further demonstrated in the 1971 wireworm trials in which average stand counts of 28.0 for DiSyston 15G (two pound rate) and 29.7 (highest stand count) for Aldrin 20G (one pound rate) were obtained as compared to the Thimet (one pound rate) stand count of 47.7.

In the 1971 wireworm control trials Thimet 15G at the one pound rate and Dyfonate 10G at the one pound rate did not differ significantly from the higher rates of these same insecticides. However, it is interesting to note that stand counts were higher at the lower rates. This may be attributable to plant phytotoxicity.

Overall stand counts obtained in the 1971 wireworm control trial were somewhat lower than anticipated. Several factors could account for this. Covering blades must be adjusted properly in order to insure a light covering of soil over the insecticide granules. This will help to prevent the granules from being blown out of the band, which, in effect, reduces the rate of the insecticide. Also, high wind velocity at the time of granular insecticide application can blow the granules out of the band. Wind protectors are available for attachment on the row banders to prevent this. Finally, an adequate amount of rainfall within several days after granular application is extremely helpful in breaking down the insecticide granules and moving the chemical into the soil.

Acknowledgements

Appreciation is expressed to the following for cooperation and assistance during the work on the 1970-71 wireworm control trials: Glenn Anderson, Sheldon, Roger McDonald, Leonard, George Petrich, Sheldon, Gerald Thompson, Wyndmere, farmers, for their land and equipment; and Dr. Robert B. Carlson, entomologist, North Dakota State University, for statistical analysis of raw data. Chemical companies that provided insecticides used in the wireworm control trials included American Cyanamid Co., Chemagro Chemical Corp., Geigy Chemical Co., Shell Chemical Co., Stauffer Chemical Co., and Velsicol Chemical Co.

The use of insecticidal trade names in this report does not represent endorsement of one product over another.