

Endrin—A New Insecticide for Sugar Beet Webworm Control¹

R. E. HAMMAN AND R. T. NELSON²

With the advent of the chlorinated hydrocarbon and organic phosphate insecticides following World War II, insect control studies have taken a prominent place in the agricultural research programs of state and federal experiment stations as well as private industry. Any discussion at this meeting on bettering the quality as well as the quantity of sugar beets would not be complete without mentioning some of the latest results which have been obtained in man's never ending struggle with insects for possession of our food supply, in this instance sugar beets.

One of the more important pests attacking sugar beets, particularly in the Rocky Mountain and Great Plains states, is the sugar beet webworm (*Loxostege sticticalis* (L)). Outbreaks of this pest are sporadic, varying with generations within a season as well as with locality and season. In spite of this irregularity of infestation more money is probably spent on sugar beet webworm control than on any other insect pest attacking sugar beets.

Paris green was formerly the standard insecticide for webworm control, followed for a short period by pyrethrum. In 1951, Douglass and Romney (1)³ reported on the comparative toxicity of several new insecticides to the sugar beet webworm. Included in this study was a material known as Corapound 269 which was later given the common name Endrin. This material has shown considerable promise against a variety of lepidopterous pests including tobacco hornworms, tobacco budworm, cotton bollworm, cotton leafworm, cabbageworms, corn earworm, army worms and cutworms. Because of the excellent control of sugar beet webworm with Endrin shown by Douglass and Romney plans were made to evaluate Endrin on a field scale basis in 1952. Lack of sufficient webworm infestation in 1952 delayed field evaluation until 1953.

Methods and Results

At the first appearance of sugar beet webworm larvae near Longmont, Colorado, in June, 1953, small plot tests were initiated which included Endrin as well as other chemicals presently being used for webworm control. It was immediately apparent that a dosage rate of 0.2 pound Endrin per acre gave rapid and outstanding control of first and second instar webworm. Subsequent treatment of large fields, both by air and by ground equipment, substantiated this finding. In order to give Endrin a thorough testing, arrangements were made to obtain sufficient supplies of Endrin to treat a large percentage of the sugar beet acreage under contract to the Longmont plant of the Great Western Sugar Company. Since the entire infestation period of this generation of webworm would last no longer than three weeks,

¹ Approval of label was obtained February 4, 1954, for use of Endrin on sugar beets.

² Entomologist, Shell Chemical Corporation, Agricultural Chemicals Division, Denver, Colorado, and Plant Physiologist, Great Western Sugar Company, Longmont, Colorado, respectively.

Numbers in parentheses refer to literature cited.

a dosage rate of 0.3 pound Endrin per acre was decided upon as an average rate in view of the premise that webworms are more difficult to kill as they increase in size.

Simultaneously with the experimental program at Longmont similar programs of smaller scope were begun at the Scottsbluff, Nebraska, and Billings, Montana, plants of Great Western Sugar Company as well as at the Worland, Wyoming, plant of Holly Sugar Company. Results of these tests are given in Table 1.

Table 1.—Sugar Beet Webworm Control Obtained with Endrin in Terms of Total Farms and Acreage Involved.

Lbs. Endrin/Acre	Total Farms	Total Acreage	Degree of Control		
			Fair	Good	Excellent
0.3	67	1,666	1/20 ¹	6/120 ¹	60/1526
0.4	24	394	0/0	2/30	22/364
Total	91	2,060	1/20	8/150	82/1890

¹ 1/20 = 1 farm/20 acres; 6/120 = 6 farms/120 acres

As indicated in the tabulation of results, Table 1, Endrin was used on 91 farms totalling 2,060 acres in this field scale evaluation for sugar beet webworm control. A dosage rate of 0.3 pound actual Endrin per acre was used on 67 farms totalling 1,666 acres. A dosage rate of 0.4 pound actual Endrin per acre was used on 24 farms totalling 394 acres. Control was rated as fair, good or excellent. Excellent results were obtained on 82 farms totalling 1,890 acres; good results were found on 8 farms totalling 150 acres; and fair results were obtained on 1 farm totalling 20 acres.

Compiled notes of observations by the writers, agricultural managers and fieldmen of the various cooperating agencies indicated the following:

1. Webworm kill was quick and complete on a high percentage of the population. This was the case whether the worms were small or large.

2. The control and kill of worms were commonly obtained within a 12-hour period after treatment.

3. In cases where kill was not obtained within the 12-hour period, a residual toxicity of Endrin was evidenced by better control during subsequent observations.

4. Worms were noted as continuing to die over as long a period as 4 to 5 days after treatment. This was particularly noticeable in one field which was partly treated when the oldest worms were no more than in the second instar stage of development. Numerous eggs were still unhatched. Control of webworm on the treated area was highly effective, and the contrast in webworm population and insect-riddled beet leaves of the treated versus untreated area became increasingly apparent as the webworm season progressed.

5. Consistency of results with Endrin over a wide range of conditions was apparent and contrasted with varying results encountered in use of other insecticides.

6. Endrin was easily applied as an emulsion in water with standard spraying equipment. There was no injury to sugar beet foliage from this emulsion.

Toxicology

No cases of toxic effects to operators of ground or air equipment were reported. Standard precautions observed with any of the chlorinated hydrocarbons should be observed when using Endrin. These should include:

1. Wash thoroughly with soap and water after handling and before eating or smoking.
2. Wear clean clothing.
3. In case of accidental spillage on person or clothing, immediately remove clothing and flush skin or eyes with plenty of water; for eyes, get medical attention.

Residues

Sugar beet pulp taken from beets treated with Endrin at dosage rates of 0.3-0.6 pound actual Endrin per acre both at 20- and 90-day intervals before harvest analyzed less than 0.1 part per million, this figure being the sensitivity of the method.

Table 2.—Residue Analysis, Sugar Beet Pulp and Tops Treated with Endrin.

Type of Material	Lbs. Endrin /Acre	No. of Applications	Interval Treatment to Harvest	Toxicant Found, ppm
Sugar beet pulp	0.3	1	90	<0.1 ¹
Sugar beet pulp	0.4	1	90	<0.1
Sugar beet pulp	0.3	1	20	<0.1
Sugar beet pulp	0.6	1	20	<0.1
Sugar beet tops	0.3	1	90	<0.1
Sugar beet tops	0.4	1	90	<0.1
Sugar beet tops	0.3	1	20	0.64
Sugar beet tops	0.6	1	20	0.84

¹ Values are based on several individual analyses made on composite samples.

Sugar beet tops treated 90 days ahead of harvest at dosage rates of 0.3-0.4 pound actual Endrin analyzed less than 0.1 part per million. Sugar beet tops treated 20 days ahead of harvest at a dosage rate of 0.3 pound actual Endrin per acre analyzed 0.64 part per million while a dosage rate of 0.6 pound actual Endrin per acre analyzed 0.84 part per million. No rainfall occurred in the test area during the 20-day period from application to harvest. There is no known translocation of Endrin within plant tissues, and the results of Table 2 add further confirmation that Endrin is not translocated.

Status of Recommendations

The above data have been submitted to the Labelling Division, Production and Marketing Administration, Washington, D. C., in support of a label application for the use of Endrin against the sugar beet webworm. Approval is pending.

Literature Cited

- (1) DOUGLAS, J. R. and ROMNEY, VAN E.
1952. Comparative toxicity of some new insecticides to the sugar beet webworm in Colorado, 1951. Proc. Amer. Soc. Sugar Beet Tech. pp. 503-506.