

Field Eradication of the Potato Rot Nematode, *Ditylenchus destructor*: A 29-Year History

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ABSTRACT

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The potato rot nematode, *Ditylenchus destructor*, was first found in Wisconsin in 1953. Since then, 282.8 ha of infested land have been fumigated with ethylene dibromide. Chemical applications consisted of a fall split-plow sole treatment of 4 gal/0.4 ha (1 acre) initially and followed in 10-14 days by a 2-gal rate made during late August or September. Subsequent surveys have not uncovered a single infested tuber in treated fields although some of the most heavily infested soils treated have had as many as 10 potato crops. Spread of the pest has been stopped through the elimination of infection sources by fumigation, a strict state quarantine limiting movement of infected tubers, and supervision of the disposition of potatoes from infested fields.

An infestation of the potato rot nematode, *Ditylenchus destructor* Thorne, was found in Wisconsin in 1953. Although most infestations were light, severity ranged from a few tubers (light) to 100% of the tubers in local, irregularly shaped areas of a field (heavy). Excellent control was reported in 1959 after a fall split-plow sole application of 4 gal/0.4 ha of 85% ethylene dibromide (EDB) followed in 10-14 days by 2 gal/0.4 ha (3). In addition to fumigation, a continuing annual survey and inspection have been made of each fumigated field and other potato fields in the area. Upon discovery of the pest, a state quarantine was initiated to restrict movement, storage, sale, and disposal of tubers from infested fields.

All reported infestations were confirmed by nematologists at the University of Wisconsin at Madison and the Wisconsin Department of Agriculture, Trade, and Consumer Protection. All infested and possibly contaminated parcels of land were mapped and severity of infestation recorded. This paper emphasizes those factors in the fumigation-quarantine program that have played a significant role in the eradication of this pest from more than 282.8 ha of infested soil from 1953 to 1982.

From 1953 through 1981, 695.6 ha

consisting of 80 individual fields have been found infested with this pest. During this period, 282.8 ha of infested land and 80.4 ha possibly contaminated by this pest have been fumigated with EDB. Not a single infested tuber has been found on any of the EDB-treated fields after the fall split-plow sole application. Potato crops grown on each field have been inspected carefully since the fumigant was applied. Detailed historical records from six representative fields have been selected to emphasize the effectiveness of EDB under a wide range of conditions.

CASE HISTORIES

Field 1, 10.4 ha. This field was classed as heavily infested, with 100% of the tubers showing severe breakdown in three irregularly shaped areas of about 1.6-3.2 ha each. The grower first noted areas in the field with rotted tubers that spread slowly in at least two potato crops before the problem was identified. Other fields in his operation were subsequently found infested, with each infestation apparently originating in dumped culls and rotted tubers. The entire field was fumigated in the fall of 1955 and three successive potato crops were grown in 1956-1958, after which the normal potato-oat-red clover rotation was resumed. Ten potato crops have been grown on this field since fumigation. No infected tubers have been detected.

Field 2, 31.2 ha. Severely infested tubers in several small areas of the field were first found in 1955. The field was cropped to beans in 1956 and oats in 1957 and then fumigated in the fall of 1958 after a spring oats crop had been harvested and the straw residue thoroughly disced. Successive potato crops were planted in 1959 and 1960 and were followed by oat-bean rotation. No infected tubers have

been found in eight potato crops since fumigation.

Field 3, 15.2 ha. A moderate infestation was found in 1953. A few areas of infestation involving 10-30% of the tubers were found in small scattered spots in the field. The field was fumigated in 1958. Eight potato crops have been grown without finding a single infected tuber.

Field 4, 6.0 ha. A general but moderate infestation of scattered tubers was found in 1958. The field was expanded to 11.2 ha and fumigated in the fall of 1960. No infected tubers have been found after six potato crops.

Field 5, 26.0 ha. A light infestation (a few scattered tubers) was found in 1954 and was followed by a grain-clover-pea rotation except in 1959 and 1962, when restricted permission was granted within the framework of the quarantine to plant potatoes without fumigation. Potatoes were free of nematodes in both years. As a precaution, however, the entire field was fumigated in 1963. No infected tubers have been found in five subsequent potato plantings.

Field 6, 4.8 ha. A light infestation of a few scattered tubers was found in 1958, and the field was fumigated in 1960. No infected tubers have been found in six subsequent potato crops.

DISCUSSION

During the 29-yr period since the potato rot nematode was first identified in Wisconsin, 282.8 ha of infested land and another 80.4 ha of possibly contaminated land have been fumigated with a single fall split-plow sole application of EDB. No infected tubers have been found on any of the treated fields where infestations had ranged from severe to light. Efforts to recover *D. destructor* from the soil after EDB treatment were unsuccessful. It seems reasonable to conclude that the nematode has been eradicated from this treated acreage.

The overall incidence of this pest has decreased rapidly. During 1953 to 1963, 68 infested fields were found, but only 12 fields have been identified during the last 19 years. Of all factors involved in the quarantine program, we believe the supervised movement and disposition of tubers from infested land has played a major role in limiting spread.

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Weed hosts apparently are not a factor affecting survival of this nematode in Wisconsin. Repeated attempts to recover *D. destructor* from weeds growing in heavily infested soil were unsuccessful; *D. destructor* has not been recovered from any cultivated crop other than potato. Several hosts of *D. destructor*, however, have been reported (2), and Anderson (1) states that weed hosts are important to survival and population buildup in Europe, particularly in Sweden. Although Faulkner and Darling (4) demonstrated that *D. destructor* fed and reproduced on a wide range of fungi isolated from soil and infested tubers, their role as a host in nature is not clearly understood. Different isolates of this nematode were observed to increase, often in great

numbers, on fungus cultures for more than 12 yr without losing pathogenicity. Isolates of this nematode that were collected from widely separated geographic areas and a variety of hosts differed greatly in pathogenicity to potato but could not be distinguished morphologically (5).

Compared with the economic value of the potato crop, the cost of the fumigant and its application is considered a reasonable practice. Equipment used in a potato operation can easily be adapted for use in fumigation and once calibrated, can easily be operated.

As far as we know, this is the only well-documented report of a nematode pest being eradicated from light to heavily infested soil after fumigation.

ACKNOWLEDGMENT

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