A SURVEY OF CERTAIN VEGETABLE GROWING AREAS IN ONTARIO FOR THE OCCURRENCE OF ROOT-KNOT NEMATODE

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Introduction

During the past few years the Nematology Section of Research Station at Harrow, Ontario has received an increasing number of plant specimens which showed either the presence of, or damage by, the root-knot nematode. Most of the specimens were submitted by growers who farm muck soil. It was evident that root-knot nematode should be investigated and, in doing so, special consideration be given to muck areas. In consequence, a survey was carried out, the main purposes of which were to determine the species of the nematodes involved, the extent of their occurrence, the amount of damage they did to cultivated crops, and the possible role of weeds as reservoir hosts. The findings of the survey, carried out during the summer of 1960, are reported below.

Methods and Procedures

Samples of crops, weeds and soil were obtained from 43 fields in six widely separated areas in Ontario. In each field 20 crop plants were selected at random and removed from the soil with a minimum of root disturbance. These roots, freed of soil by shaking, were examined for nematode galls and categorized on the visual evidence of nematode damage as follows: None - no galls, Slight-galls on 1 to 4 roots, Moderate - galls on 5 to 9 roots, Heavy - galls on 10 or more roots. A portion of the root of each specimen showing galls was saved for more detailed examination and identification of the nematode by the methods described by Taylor et al (2). A similiar procedure was followed with respect to weeds growing in the fields.

In each field, samples of soil, taken from the top four inches at 10 random locations, were bulked and mixed. A 1.5-pound sample of the mixture was regarded as representative of the field. The samples were assayed by using tomato seedlings as indicator plants; the number of galls occurring on their roots after four weeks being regarded as indicative of the nematode population in the field.

Results

Identity of the nematode

An attempt was made to examine the perineal pattern of at least five of the females obtained from each root sample. The perineal pattern, a characteristic used in identification, is the finger-print-like pattern formed by the annulations of the cuticle in the perineal region of the body of the female. Most of the patterns

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were rounded, with low dorsal arches and some were flattened dorsally, features which indicated that the species involved was either Meloidogyne hapla or M. arenaria. At least one of the patterns in five had punctuations which indicated that M. hapla was a constant component of the nematode population. Moreover, a characteristic host reaction to M. hapla (1), observed on the various crops indicated almost conclusively that M. hapla was, if not the only, then by far the most predominant species encountered in the survey.

Field incidence and soil infestation

Visual examination of specimen crop plants showed that *26* of the **43** fields sampled were infested with root-knot nematode, whereas the assay of soil samples revealed the presence of the nematode in only 14 fields. It would appear that assay is a less reliable method for demonstrating the presence of the nematode in fields. The location of the fields and the relative degree of infestation, as indicated by the two methods, are shown in Table **1.**

Table 1. Nematode infestation as shown by two methods.

		Fields Infested		Degree of Infestation		
Areas Surveyed	Fields Surveyed	Assay Method	Plant Exam.	Slight	Mod.	Heavy
Port Colborne	**3**	**3**	3	**0**	1	2
Burlington	**4**	**1**	**1**	1	0	0
Grand Bend	12	3	7	4	1	2
Holland Marsh	15	5	9	1	**3**	5
Jeannette's Creek	7	1	4	**1**	2	1
Harrow	2	**1**	2	**1**	0	**1**
Total	**43**	14	26	**8**	**7**	**11**

Host infestation

A. Cultivated crops. Seven crops were examined in the field and all were found to be susceptible to root-knot nematode. Differences in their degree of susceptibility were noted during the laboratory examination of roots. According to Sasser's (1) categories, lettuce was the most susceptible, followed by celery, carrots, and onions in that order of decreasing susceptibility. Too few samples of other crops were taken to establish their relative susceptibility.

B. Weeds. Fourteen species of weeds growing in the surveyed fields were examined for the presence of root-knot nematode. Seven were found to be infested: oak-leaved goose foot, Chenopodium glaucum L. ; Canada thistle, Cirsium arvense (L.) Scop. ; wild carrot, Daucus carota L. ; annual daisy fleabane, Erigeron annuus (L.) Pers. ; spotted knot weed, Polygonum persicaria L. ; cinquefoil, Potentilla intermedia L. ; and sow thistle, Sonchus asper (L.) Hill. Seven others were free of infestation: ragweed, Ambrosia artemisiifolia L. ; pigweed, Amaranthus

retroflexus L.; lamb's quarters, Chenopodium album L.; prostrate knot weed, Polygonum aviculare L.; purslane, Portulaca oleracea L.; dock, Rumex crispus L.; and pennycress, Thlaspi arvense L.

Discussion

It is clear from the foregoing that Meloidogyne hapla, the northern root-knot nematode, is becoming a problem of increasing importance in most of the vegetable-growing areas of southern Ontario. More than one-half of the fields surveyed were infested, as shown by the plant examination method. This suggests that many growers in the areas concerned must have incurred some loss as the result of nematode damage to their crops. As a matter of record, 15 of 28 growers visited had either plowed under some portion of their crop acreage or had resorted to soil fumigation because of nematode damage.

Of practical, as well as of academic interest is the fact that vegetables differ in their degree of susceptibility to the pest; lettuce being the most susceptible followed by celery, carrots and onions. Crop susceptibility, however, has apparently little or no direct bearing on the losses caused by root-knot nematode; the most serious losses being sustained by growers of carrots, a crop of moderate susceptibility. In carrots, of course, it is the edible portion of the plant that is attacked and which must be discarded even though showing only slight nematode damage. Then, too, carrots have a longer growing season than the more susceptible crops and are thus exposed to attack for a longer period in infested soils. In the case of lettuce and celery, the roots, rather than the edible portion of the plant are attacked and nematode damage can be compensated for by a heavier application of fertilizer.

While several weeds were shown to be hosts for M. hapla, their significance in regard to initiating or perpetuation of field populations of the nematode is not known. Field observations also yielded some evidence of a possible correlation between amount of snow coverage and degree of nematode injury. Both these points require further investigation.

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