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STUDY OF ROOT-KNOT PROBLEMS IN AJIWA DAM AREA, KATSINA STATE, NIGERIA

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Abstract

The present study was undertaken to observe the root-knot problems in Ajiwa dam area, Katsina state. Surveys were done to determine the level of infestation, incidence, intensity and frequency of root-knot disease and to identify the root-knot nematodes associated with vegetables. The study showed that root-knot disease incidence in the area was fairly very high. Of the fields visited, about 42% fields were infested. Incidence of the disease in different fields and on different vegetables showed wide variation. Short pepper and tomato were most affected crops followed by onion, lettuce and carrot. Spinach was less affected. Two species *M. incognita* and *M. javanica* of root-knot nematodes were identified. *M. incognita* showed highest frequency (71.4%) and was dominant species in the studied area. *M. javanica* has lowest frequency (28.5%).

Key words: Root-knot, Vegetable, Diseases, *M. incognita*, *M. javanica*, Incidence, Intensity, Fields.

Introduction

Plant parasitic nematodes are widely found in many parts of the world especially in tropical and sub-tropical areas and often occur in great numbers, wherever moisture is present and being more numerous than any other animal of similar size (Taylor, 1987). They feed on roots, other underground parts and in some cases above ground parts of plant causing great damages. The endoparasitic form causes damage to individual cells either by direct feeding or mechanical pressure when moving in or out of the plant tissue (Mickerry and Robert, 1985).

Some plant parasite nematode are characterized by the formation of distinct swelling (galls or knots) on the roots of susceptible host plant as their symptoms of infection, these are called root-knot nematodes and they are among the most serious plant pest because of their adaptability, pathogenicity, worldwide distribution and extensive host range (Draistadt *et al.*, 1994).

Root-knot nematode (*Meloidogyne* species) are recognized as one of the major group of plant pathogens affecting world food production (Sasser, 1980). Vegetable, cereals, pulse, oil seed crops, fibre yielding crops, ornamentals, fruit, trees and plantation crops grown in different parts of the world are affected by these nematodes but vegetables are considered as their preferred host crop (Khan and Khan, 1990).

The research was aimed for examining the incidence of root-knot disease and evaluating their frequency of occurrence and intensity in Ajiwa dam area, Katsina, Nigeria and also identifying the species of root-knot nematodes present.

Materials and method

Several fields of vegetables were visited for root-knot nematodes in a number of localities of the Ajiwa dam area. Five to ten samples were collected at random from each of the field plot in the locality. Infected samples were kept in polythene bags and brought to laboratory. Root samples were thoroughly washed under tap water and were examined for the presence of galls and egg masses.

The incidence of disease in the field and vegetables were calculated as follows:

$$\text{Incidence of disease on vegetables} = \frac{\text{No. of infected samples of a vegetable}}{\text{Total no. of collected sample of vegetables}} \times 100$$

$$\text{Incidence of disease in the field} = \frac{\text{No. of infested field}}{\text{Total no. of visited fields}} \times 100$$

Intensity of disease (GI/EMI) was calculated by the scale of Taylor and Sasser (1979) as $\underline{0} = 0$, $\underline{1} = 1-2$, $\underline{2} = 3-10$, $\underline{3} = 11-30$, $\underline{4} = 31-100$ and $\underline{5} =$ more than 100 galls or egg masses present on the root system. Species of root-knot nematodes were identified on the basis of perineal pattern (Eisenback *et al.*, 1981) and calculated as follows:

Frequency of species on vegetables = $\frac{\text{No. of infected samples with a species on crop}}{\text{Total no. of infected samples of the same crop}} \times 100$

Frequency of species in the field = $\frac{\text{No. of infected samples with a species in the field}}{\text{Total no. of infected sample in the same area}} \times 100$

Results

The overall field infestation with root-knot nematode was 42% (Table 1.0). Two species *M. incognita* and *M. javanica* were found to be present in all the fields visited, however, *M. javanica* was found only in four fields. The frequency of *M. incognita* was greater than *M. javanica*, the frequency of *M. incognita* and *M. javanica* were 71.4% and 28.5% respectively (Table 1.0).

Table 1.0: Incidence and intensity of root-knot disease and frequency of occurrence of *Meloidogyne* species in the fields of Ajiwa dam area, Katsina state

Fields	Observed sample	Infected sample	Incidence of disease	<i>M. incognita</i>		<i>M. javanica</i>		Intensity GI/EMI
				sample	frequency	sample	frequency	
Yahuza field	10	6	60.0	5	83.3	1	16.6	5/5
Sani field	7	3	42.8	2	66.6	1	33.3	4/4
Muhammad field	9	2	22.2	2	100.0	0	0.0	3/3
Yahaya field	10	5	50.0	3	60.0	2	40.0	5/5
Ibrahim field	8	4	50.0	2	50.0	2	50.0	4/4
Umar field	6	1	16.6	1	100.0	0	0.0	2/2
Total	50	21	42	15	71.4	6	28.5	2-5/2-5

GI = Gall index, EMI = Egg mass index

The intensity of the disease on the basis of GI/EMI showed a wide range of variations between the fields in the studied area. The overall intensity of the disease in the area was mild to severe based on gall index (2-5) and egg mass index (2-5) ranges (Table 1.0).

Among the vegetables, highest incidence of the disease was observed on short pepper with frequency of 71.4% followed by onion with 60.0%. In tomato and carrot the incidence was also above 50%. The incidence of the disease in spinach, lettuce and long pepper was comparatively very low (22.2%, 28.5% and 25%) (Table 2.0). The *M. incognita* was found associated with all the vegetables with variations in the frequency. However, *M. javanica* was found on tomato, onion, carrot and short pepper. The frequency of *M. incognita* was greater than *M. javanica*. The frequency of *M. incognita* was 71.4% and the frequency of *M. javanica* was 28.5% (Table 2.0).

The intensity of the disease on different vegetables in terms of GI/EMI were noticed separately. The highest intensity was observed on tomato and short pepper, however, the lowest was on long pepper (Table 2.0).

Table 2.0: Incidence and intensity of root-knot disease and frequency of occurrence of *Meloidogyne* species found on vegetables in Ajiwa dam area, Katsina state

Vegetables	Observed sample	Infected sample	Incidence of disease	<i>M. incognita</i>		<i>M. javanica</i>		Intensity GI/EMI
				sample	frequency	sample	frequency	
Tomato	8	4	50.0	2	50.0	2	50.0	5/5
Spinach	9	2	22.2	2	100.0	0	0.0	3/3
Onion	5	3	60.0	2	66.6	1	33.3	4/4
Carrot	6	3	50.0	2	66.6	1	33.3	4/4
Lettuce	7	2	28.5	2	100.0	0	0.0	3/3
Long pepper	8	2	25.0	2	100.0	0	0.0	2/2
Short pepper	7	5	71.4	3	60.0	2	50.0	5/5
Total	50	21	42	15	71.4	6	28.5	2-5/2-5

GI = Gall index, EMI = Egg mass index

Discussion

Of the four major species of root-knot nematodes in the world, two species namely *M. incognita* and *M. javanica* were recorded in Ajiwa dam area. The overall incidence of the root-knot disease on vegetables in the area showed that *M. incognita* is widely distributed and is infesting a high percentage of vegetables fields. The GI and EMI rating indicating that crops are suffering sufficiently in the area. High EMI ensures high population build up which may endanger the ensuing crops. Short pepper, tomato, onion and carrot are highly affected crops of the area, but lettuce, spinach and long pepper are less affected.

Sasser (1979) remarked that potential for damage caused by root-knot nematodes is ever present in the tropics. Mai (1985), stated that because of root-knot nematodes particularly *M. incognita*, it is very difficult and sometimes impossible to grow important vegetables such as tomato in tropics and semi-tropics. In the present study, *M. incognita* emerged as most frequent species in the study area being dominant in all the fields while *M. javanica* was found only in four fields. Such concentration of a species in specific field has a significance in crop cultivation in that particular fields in relation to susceptibility of a crop or cultivar to a given species. Among the species of root-knot nematodes, the most important species on the world wide basis is unquestionably *M. incognita* (Sasser, 1980). Second position in terms of frequency and relative importance is occupied by *M. javanica*. These species are also undoubtedly the commonest and most wide spread root-knot nematodes in sub-tropical and Mediterranean climates (Lamberti, 1979). *M. incognita* and *M. javanica* have overlapping ecological requirements. They inhabit in areas with average annual temperature 15°C and 33°C (Sasser and Carter, 1985). Such climate of Nigeria is conducive for their occurrence.

Conclusion

The present study shows that all fields of vegetables are infested by root-knot nematodes in the Ajiwa dam area, Katsina state. The study also indicates that the incidence and intensity of disease on major vegetables are fairly high in the area. The wide spread occurrence of root-knot disease, presence of two major species of *Meloidogyne* with dominance of *M. incognita* and level of infestations would certainly be reflecting in the productivity of the crops grown in the area. This could be taken into account in the disease management strategies.

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