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University of Tennessee Agricultural Experiment Station

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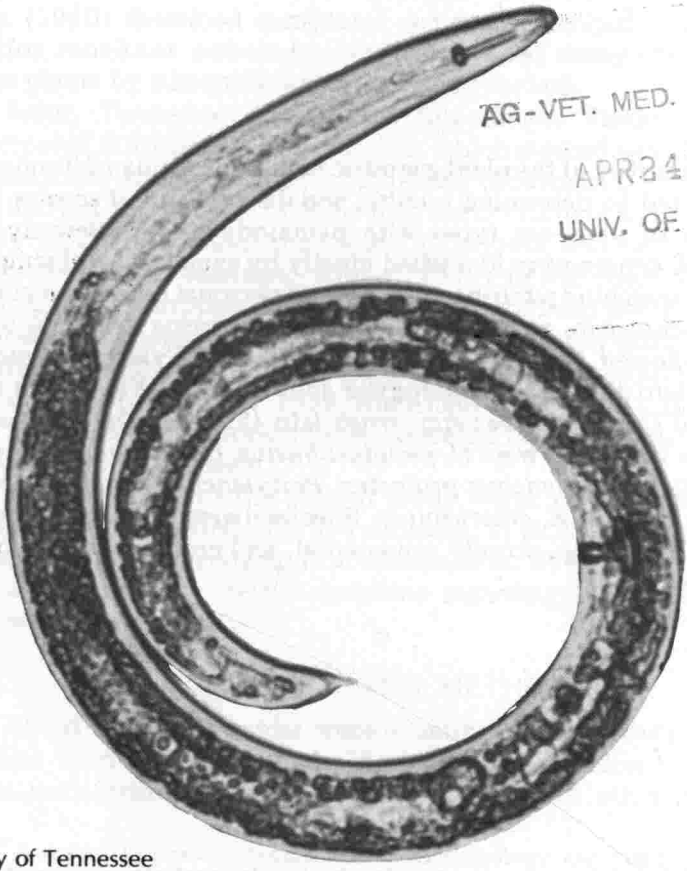

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TABLE OF CONTENTS

Abstract: A survey of the plant-parasitic nematode fauna of Tennessee was conducted to determine number and distribution of species, and associations of plant-use types with nematode species. Seventy-five species in 26 genera were identified mostly by examining soil samples, but also by searching published records and personal communications. *Helicotylenchus* spp. were most abundant, occurring in 63.2% of all samples, followed by *Pratylenchus* spp. (43.6%), *Tylenchorhynchus* spp. *sensu lato* (43.1%), *Meloidogyne* spp. (41.0%), *Xiphinema* spp. (32.0%) and *Criconemoides* spp. *sensu lato* (29.0%). The most common species identified were *H. pseudorobustus*, *Hoplolaimus galeatus*, *M. incognita*, *Paratylenchus projectus*, *Pratylenchus scribneri*, *Quinisulcius acutus*, and *X. americanum*. Species diversity appeared greatest in turf, field crop, woody ornamental, and commercial vegetable associations.

COVER PHOTO: *Helicotylenchus pseudorobustus*, the most commonly collected plant parasitic nematode in Tennessee.

Identification, Distribution, and Plant Associations of Plant-Parasitic Nematodes in Tennessee

E. C. Bernard*

The study of plant-parasitic nematodes in Tennessee had an early beginning. Scribner (1889) observed root-knot nematodes (*Meloidogyne* sp.) on clematis and peach roots, and lesion nematodes (*Pratylenchus* sp.) on potato tubers. He clearly recognized differences between the two species, and accurately sketched the tuber malformations associated with the lesion nematodes. Whittle and Drain (1940) described symptoms and recommended control measures for root-knot nematodes, and categorized many common Tennessee plants by susceptibility to *Meloidogyne* spp.

Later, Tennessee Agricultural Experiment Station personnel participated in Regional Project S—19, which studied the distribution of nematodes associated with crop decline (Southern Coop. Ser. Bull. 74, 1960). Although still of some use, the S—19 data were comprised mostly of generic, rather than specific, records, and listed relatively few records for Tennessee. Klobe (1976) determined the relative occurrence of plant-parasitic nematodes in soybean fields of western Tennessee, but identified them only to genus. A few compilations of nematode species have been published for other southern states (Chapman, 1957; Norton, 1959; Birchfield et al., 1978), and Ponchillia (1975) listed nematode species collected in tobacco fields of middle and eastern Tennessee.

The objectives of the present study were: 1) to identify species of plant-parasitic nematodes in Tennessee; 2) to determine their relative abundance and geographical distribution; 3) to correlate species with crops to make better decisions regarding future nematology studies in the state.

MATERIALS AND METHODS

About 600 soil samples were examined in this study, of which 234 had been submitted to the Agricultural Extension Service. The others were gathered during field experiments or other surveys, or

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submitted by other interested persons. Nematodes were extracted from soil samples by a sugar flotation-centrifugation method (Jenkins, 1964). Plant-parasitic nematodes were hand-picked from extracts, killed and fixed with hot 4% formalin, and processed to glycerin by a rapid method (Seinhorst, 1959). Recent keys, compendia, and descriptions were used to identify collected nematodes.

For tabulation purposes in Table 1, a number of genera were grouped in formerly broadly defined genera, including *Criconema (Crossonema)*, *Criconemoides (Criconemoides, Lobocriconema, Macroposthonia, Nothocriconema, Xenocriconemella)*, *Trichodorus (Paratrichodorus)*, and *Tylenchorhynchus (Merlinius, Quinisulcius, Tylenchorhynchus)*. Species were assigned to presently accepted genera in Table 2.

Members of *Tylenchidae*, *Psilenchidae*, and *Neotylenchoidea*, although frequently extracted from soil, were not included in this study.

Table 1. General of plant-parasitic nematodes identified from 234 soil samples submitted to the Tennessee Agricultural Extension Service, 1977-1979.

Genus (common name)	Samples containing genus	
	Number	Percent
Aorolaimus (spiral)	2	0.8%
Criconema (sensu lato)	1	0.4
Criconemoides (sensu lato) (ring)	68	29.0
Gracilacus (pin)	8	3.4
Helicotylenchus (spiral)	148	63.2
Hemicycliophora (sheath)	2	0.8
Heterodera (cyst)	22	9.4
Hoplolaimus (lance)	45	19.2
Meloidogyne (root-knot)	96	41.0
Paratylenchus (pin)	51	21.8
Pratylenchus (lesion)	102	43.6
Rotylenchus (spiral)	1	0.4
Scutellonema (spiral)	1	0.4
Trichodorus (sensu lato) (stubby-root)	15	6.4
Trophonema	2	0.8
Tylenchorhynchus (sensu lato) (stunt)	101	43.1
Xiphinema (dagger)	75	32.0

Table 2. Known distribution by county of plant-parasitic nematodes collected in Tennessee.

Aorolaimus helicus Sher: Henderson, Knox.
Aphelenchoides fragariae (Ritzema-Bos) Christie: Bradley, Davidson, Hamilton, Knox, Meigs, Rhea (Tenn. Dept. Agr., 1979).
Criconemoides informis (Micoletzky) Taylor: Sumner.
Crossonema civellae (Steiner) Mehta & Raski: Knox.
Ditylenchus dipsaci (Kűhn) Filipjev: Knox (C. J. Southards, pers. comm.).
Gracilacus straeleni (de Coninck) Raski: Shelby.
Helicotylenchus anhelicus Sher: Knox, Union.
H. bradys Thorne & Malek: Cocke.
H. caroliniensis Sher: Hamilton.
H. digonicus Perry: Greene, Johnson, Knox.
H. dihystera (Cobb) Sher: Anderson, DeKalb, Madison, Shelby, Sumner.
H. erythrinae (Zimmerman) Golden: Knox, Shelby, Union.
H. exallus Sher: Gibson.
H. glissus Thorne & Malek: Greene.
H. labiodiscinus Sher: Henderson.
H. microcephalus Sher: Jefferson.
H. platyurus Perry: Cocke, Hamilton, Knox, Sumner, Union.
H. pseudorobustus (Steiner) Golden: Anderson, Cocke, Davidson, DeKalb, Gibson, Greene, Hamilton, Haywood, Henderson, Jefferson, Knox, Lawrence, Lincoln, Madison, Monroe, Robertson, Shelby, Sullivan, Sumner, Tipton.
Hemicycliophora gracilis Thorne: Franklin, Knox.
H. silvestris Jenkins & Reed: Union.
Heterodera amaranthi Stoyanov: Middle Tennessee (A. M. Golden, pers. comm.).
H. cacti Filipjev & Schuurmans-Stekhoven: Knox.
H. glycines Ichinohe: In nearly all counties west of line from Macon County to Marion County (Tn. Dept. of Agric., 1979).
H. lespedezae Golden & Cobb: Haywood (Tn. Dept. of Agric., 1979).
H. trifolii Goffart: Cumberland, Greene.
H. weissi Steiner: Davidson.
Hoplolaimus galeatus (Cobb) Filipjev & Schuurmans-Stekhoven: Cocke, Dyer, Gibson, Greene, Jefferson, Knox, Madison, Marshall, Shelby, Sumner.
Lobocriconema serratum (Khan & Siddiqi) de Grisse & Loof: Hamilton.
Longidorus elongatus (de Man) Thorne & Swanger: Madison.
Macroposthonia crenata (Loof) de Grisse & Loof: Middle and East Tennessee (Ponchillia, 1975).
M. curvata (Raski) de Grisse & Loof: Davidson, Gibson, Knox, Shelby.
M. ornata (Raski) de Grisse & Loof: Cocke.
M. rustica (Micoletzky) de Grisse & Loof: Cumberland, Hamilton.
M. sphaerocephala (Taylor) de Grisse & Loof: Cocke, DeKalb.
M. xenoplax (Raski) de Grisse & Loof: Cocke, DeKalb, Hamilton, Johnson, Shelby, Sumner, Union, Warren.
M. yossifovichi (Krnjaic) Loof & de Grisse: Knox.
Meloidodera floridensis Chitwood, Hannon & Esser: "Tennessee" (Southern Coop. Res., 1960).
Meloidogyne graminis (Sledge & Golden) Whitehead: Shelby (Southards, 1967).
M. hapla Chitwood: Cocke.
M. incognita (Kofoid & White) Chitwood: general throughout Tennessee.
M. javanica (Treub) Chitwood: Cocke, Dyer.
Merlinius bavaricus (Sturhan) Siddiqi: Knox.
M. brevidens (Allen) Siddiqi: Knox, Robertson, Shelby, Sumner.

Table 2. Known distribution by county of plant-parasitic nematodes collected in Tennessee.

Nothocriconema calvum (Raski & Golden) de Grisse: Union.
N. demani (Micoletzky) de Grisse & Loof: Gibson.
N. mutabile (Taylor) de Grisse & Loof: Anderson, Cocke, Hamilton, Johnson, Knox, Shelby.
N. permistum (Raski & Golden) de Grisse: Dickson.
Paratrichodorus minor (Colbran) Siddiqi: Cocke, Davidson, Hamilton, Knox, Shelby.
P. porosus (Allen) Siddiqi: Shelby.
Paratylenchus dianthus Jenkins & Taylor: Cumberland, Lawrence.
P. neoamblycephalus Geraert: Cocke, Greene.
P. projectus Jenkins: Davidson, Fentress, Franklin, Gibson, Greene, Hamilton, Haywood, Jefferson, Knox, Lawrence, Robertson, Shelby, Sullivan, Sumner.
Pratylenchus alleni Ferris: Dyer, Greene, Knox, Robertson, Sumner.
P. crenatus Loof: Cocke, Franklin, Knox.
P. neglectus (Rensch) Filipjev & Schuurmans-Stekhoven: Jefferson, Monroe, Sullivan.
P. penetrans (Cobb) Filipjev & Schuurmans-Stekhoven: Cocke, Knox, Sumner.
P. pratensis (de Man) Filipjev: Knox.
P. scribneri Steiner: Cocke, Davidson, Gibson, Greene, Haywood, Henderson, Jefferson, Knox, Lauderdale, Lawrence, Lincoln, Madison, Marshall, Robertson.
P. thornei Sher & Allen: Cocke, Knox, Robertson, Sumner.
P. vulnus Allen & Jensen: Knox, Shelby, Williamson.
P. zeae Graham: Cocke, Shelby.
Quinisulcius acutus (Allen) Siddiqi: Cocke, Cumberland, Davidson, Gibson, Greene, Jefferson, Knox, Lawrence, Robertson, Sumner.
Q. capitatus (Allen) Siddiqi: Middle and East Tennessee (Ponchillia, 1975).
Rotylenchus buxophilus Golden: Hamblen, Madison.
Scutellonema brachyurum (Steiner) Andrassy: Knox.
Tylenchorhynchus agri Ferris: Shelby, Sumner.
T. clarus Allen: Middle and East Tennessee (Ponchillia, 1975).
T. claytoni Steiner: Cocke, Davidson, Greene, Hamilton, Jefferson.
T. martini Fielding: Davidson, Madison, Shelby.
T. maximus Allen: Cumberland, Greene, Jefferson, Knox.
T. nudus Allen: Cocke.
T. robustus (de Man) Micoletzky: Knox.
Xenocriconemella macrodora (Taylor) de Grisse & Loof: Madison, Shelby, Union.
Xiphinema americanum Cobb: Cocke, DeKalb, Dickson, Greene, Hamilton, Henderson, Jefferson, Johnson, Knox, Robertson, Shelby, Sumner, Union, Warren.
X. tenuicutis Lamberti & Bleve-Zacheo: Anderson/Roane (Oliver Springs) (Lamberti & Bleve-Zacheo, 1979).

RESULTS

In Table 1 is listed the frequency of collection of the various plant-parasitic nematode genera in Tennessee. Table 2 is a compilation of records by county for all species known to have been reported from Tennessee. Plant associations for each species are listed in Table 3. The following survey results, listed by genus, include information from Tables 1-3.

Table 3. Distribution of plant-parasitic nematodes by plant-use types in Tennessee.

Species	Category											
	field crops[1]	forage, pasture	forest, trees	home gardens	small grains[2]	orchards, vineyards[3]	herbaceous ornamentals[4]	woody ornamentals[5]	tobacco	turf	commercial vegetables[6]
Aorolaimus helicus	X										
Aphelenchoides fragariae				X							
Criconemoides informis								X			
Crossonema civellae								X			
Ditylenchus dipsaci							X				
Gracilacus straeleni								X		X	
Helicotylenchus anhelicus			X							X	
H. bradys											X
H. caroliniensis						X					
H. digonicus	X	X									
H. dihystera	X			X		X		X		X	
H. erythrinae			X					X		X	
H. exallus	X										
H. glissus		X									
H. labiodiscinus	X										
H. microcephalus		X									
H. platyurus								X		X	X
H. pseudorobustus	X	X	X	X	X	X		X	X	X	X
Hemicycliophora gracilis			X							X	
H. silvestris			X								
Heterodera amaranthi					X						
H. cacti							X				
H. glycines	X										
H. lespedezae		X									
H. trifolii		X									
H. weissi										X	

[1] corn, soybean, sunflower
[2] wheat, rye
[3] apple, crabapple, grape.
[4] cactus, phlox
[5] azalea, boxwood, holly, rose
[6] greenbean, potato, sweet potato, tomato.

Table 3. Distribution of plant-parasitic nematodes by plant-use types in Tennessee. (continued)

Species	Category											
	field crops[1]	forage, pasture	forest, trees	home gardens	small grains[2]	orchards, vineyards[3]	herbaceous ornamentals[4]	woody ornamentals[5]	tobacco	turf	commercial vegetables[6]
Hoplolaimus galeatus	X	X		X				X		X	X
Lobocriconema serratum										X	
Longidorus elongatus			X								
Macroposthonia crenata									X		
M. curvata	X			X						X	
M. ornata	X										
M. rustica		X				X					
M. sphaerocephala						X					
M. xenoplax	X	X				X	X			X	X
M. yossifovichi										X	
Meloidodera floridensis			X								
Meloidogyne graminis										X	
M. hapla											X
M. incognita	X	X	X	X		X	X	X	X	X	X
M. javanica	X										X
Merlinius bavaricus	X									X	
M. brevidens									X	X	X
Nothocriconema calvum										X	
N. demani	X										
N. mutabile	X			X		X				X	X
N. permistum								X			
Paratrichodorus minor						X				X	X
P. porosus								X			
Paratylenchus dianthus				X							
P. neoamblycephalus		X									X

[1] corn, soybean, sunflower
[2] wheat, rye
[3] apple, crabapple, grape.
[4] cactus, phlox
[5] azalea, boxwood, holly, rose
[6] greenbean, potato, sweet potato, tomato.

Table 3. Distribution of plant-parasitic nematodes by plant-use types in Tennessee. (continued)

Species	Category										
	field crops[1]	forage, pasture	forest, trees	home gardens	small grains[2]	orchards, vineyards[3]	herbaceous ornamentals[4]	woody ornamentals[5]	tobacco	turf	commercial vegetables[6]
P. projectus	X	X		X		X		X	X	X	X
Pratylenchus alleni	X			X					X	X	
P. crenatus				X	X			X	X		
P. neglectus					X	X					
P. penetrans								X		X	X
P. pratensis										X	
P. scribneri	X								X	X	X
P. thornei								X	X		
P. vulnus								X			
P. zeae						X					X
Quinisulcius acutus	X			X					X	X	X
Q. capitatus									X		
Rotylenchus buxophilus			X					X			
Scutellonema brachyurum								X			
Tylenchorhynchus agri				X				X		X	
T. clarus									X		
T. claytoni	X				X	X		X	X	X	X
T. martini	X									X	
T. maximus	X	X								X	
T. nudus											X
T. robustus										X	
Xenocriconemella macrodora			X					X		X	
Xiphinema americanum	X	X	X	X		X		X	X	X	X
X. tenuicutis		X									
TOTAL	24	14	11	14	5	14	4	22	11	33	20

[1] corn, soybean, sunflower
[2] wheat, rye
[3] apple, crabapple, grape.
[4] cactus, phlox
[5] azalea, boxwood, holly, rose
[6] greenbean, potato, sweet potato, tomato.

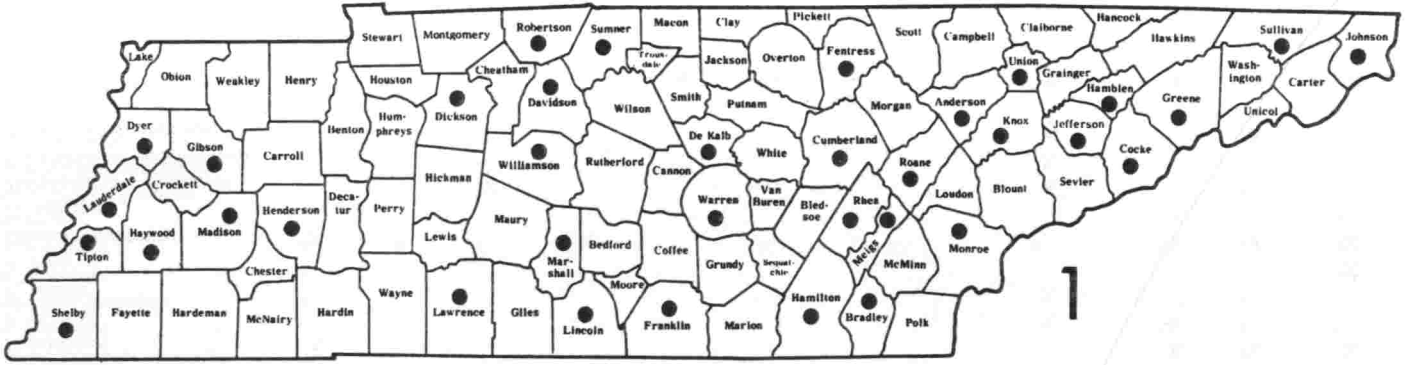

Figure 1. Counties of Tennessee from which one or more soil samples were assayed or for which literature records were found, excluding *Meloidogyne incognita* and *Heterodera glycines*.

Aphelenchoides. Although not collected in the present study, *A. fragariae* has been reported from several counties, mostly in the eastern part of the state (Tenn. Dept. of Agric., 1979). Associated crops were not reported but are presumed to have been strawberries.

Criconemoides. Only one species of this genus, *C. informis*, from soil under ornamental holly, was found in Tennessee. Most species of ring nematodes are presently placed in other genera.

Crossonema. Only one collection from woody ornamentals was made. The specimens were tentatively identified as *Crossonema civellae.*

Ditylenchus. Plant-parasitic forms of this genus were not recovered during this study, but the species was previously found on phlox (C. J. Southards, personal communication).

Gracilacus. Gracilacus straeleni was collected from soil under ornamentals and lawns in Shelby County. An undescribed species was found in Sumner County in an oak woods.

Helicotylenchus. This genus was the most commonly collected and occurred in nearly two-thirds of all samples. *Helicotylenchus pseudorobustus* was the most frequently collected species. It occurred in 20 of 36 counties sampled, and in every plant use category listed except herbaceous ornamentals. Several species apparently exhibited definable regional distributions (Fig. 2): *H. digonicus* was collected only from three eastern counties, but *H. dihystera* was found in all areas except the most eastern part of the state. *Helicotylenchus platyurus* was distributed in the eastern part and north-central regions of Tennessee. Some infrequently reported species were also collected; *H. anhelicus*, apparently known only from California, was found in two counties under turf and in forest soil, and *H. caroliniensis*, described from South Carolina, was also found in Tennessee.

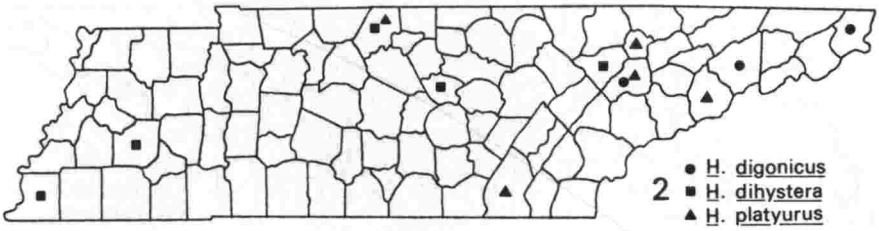

Figure 2. Known distribution in Tennessee of selected spiral nematodes (*Helicotylenchus* spp.).

Heterodera. Most collections of cyst nematodes were larvae, since special cyst extraction techniques were not used. The collection frequency (9.4% of Extension samples: Table 1) refers to species other than *H. glycines.* This species, the soybean cyst nematode, is a serious pest and occurs in nearly every county in the western half of Tennessee (Tenn. Dept. of Agric., 1979). Among species listed but not collected in the present study, *H. amaranthi* was found in north-central Tennessee (A. M. Golden, pers. comm.) and *H. lespedezae* was collected in western Tennessee (Tenn. Dept. of Agric., 1979). Although *H. trifolii* was infrequently identified from cysts, most *Heterodera* larvae found probably belonged to this species, since it is quite common in clover pastures throughout the state. *Heterodera cacti* was found on roots of ornamental cacti growing in a greenhouse and may be widely distributed under similar conditions.

Macroposthonia. This genus of ring nematodes was found to be quite common in Tennessee. Three species were associated with orchards; the most common of the three, *M. xenoplax,* can be pathogenic on several fruit-bearing trees (Lownsbery **et al.,** 1973; Mojtahedi & Lownsbery, 1975). A collection from turf was tentatively identified as *M. yossifovichi,* formerly reported only from Yugoslavia. Some characters of specimens in this collection were intermediate to those of *M. yossifovichi* and *M. rustica.* The known distributions in Tennessee of two *Macroposthonia* are given in Figure 3. *Macroposthonia curvata* was found at several sites across the state, but *M. rustica* was collected only from the east-central region.

Meloidodera. Meloidodera sp. was reported previously from pine roots in Tennessee (Southern Coop. Ser. Bull. 74, 1960). Based on the host, this species is presumed to have been *M. floridensis.*

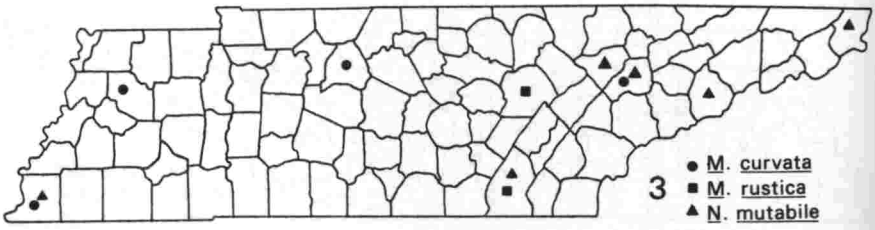

Figure 3. Known distribution in Tennessee of selected ring nematodes (*Macroposthonia, Nothocriconema* spp.).

Meloidogyne. Three species of root-knot nematodes, occurring in 41% of Extension Service samples, were collected in Tennessee during this study. Of these, most were *M. incognita*, the southern root-knot nematode, which occurs throughout the state. *Meloidogyne hapla*, the northern root-knot nematode, was found in several samples from the eastern part of the state, and *M. javanica* was collected occasionally. Southards (1967) reported *M. graminis* from under turf in Shelby County.

Nothocriconema. Species of this genus of ring nematodes apparently occurred infrequently. The most widely distributed species appeared to be *N. mutabile* (Fig. 3).

Paratylenchus. Of the pin nematodes, *P. projectus* was the most abundant, occurring most frequently in soil from pastures, woody ornamentals, and turf, and often in high numbers. One nursery-grown boxwood had 3,400 per 100 cm^3 soil in its rhizophere.

Pratylenchus. The lesion nematodes *P. scribneri* and *P. alleni* were found in samples from all regions of the state (Fig. 4). *Pratylenchus alleni* was often found associated with soybean. Most other *Pratylenchus* spp. were locally or spottily distributed. *Pratylenchus neglectus* was collected from three eastern counties (Fig. 5); *P. penetrans*, an important and abundant crop parasite in more northern regions (Mai et al., 1977) was found in several locations in middle and eastern Tennessee. In the roots of woody ornamental plants, *P. vulnus* frequently occurred in high numbers and was associated with plant decline, as reported by Benson et al., (1976).

Quinisulcius. Quinisulcius acutus (Fig. 5) was most often associated with turf, tobacco, and commercial tomatoes.

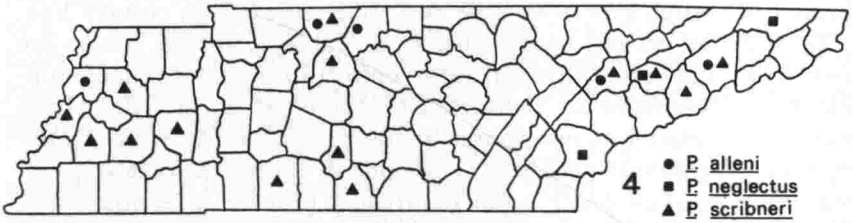

Figure 4. Known distribution in Tennessee of selected lesion nematodes (*Pratylenchus* spp.).

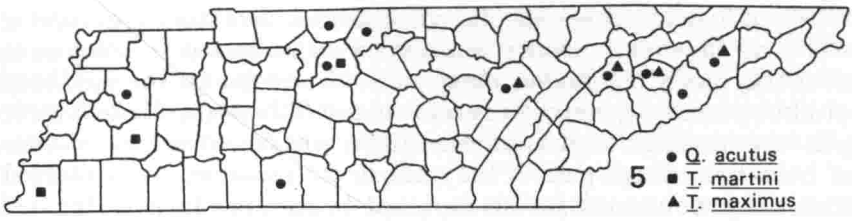

Figure 5. Known distribution in Tennessee of selected stunt nematodes (*Quinisulcius, Tylenchorhynchus* spp.).

Rotylenchus. Although known as a damaging pest of certain woody plants (Golden, 1956), *R. buxophilus* was extracted only twice, once from under a boxwood, and once from under a black gum.

Trophonema. A species closely related to *T. arenarium* was found associated with holly in Sumner County. This is apparently the only record of *Trophonema* other than several from California (Raski, 1956; Siddiqui **et al.**, 1973).

Tylenchorhynchus. Of the seven species identified from Tenessee, the tobacco stunt nematode, *T. claytoni*, occurred most frequently and in several plant associations besides tobacco. *Tylenchorhynchus martini* was identified from certain western and central counties, but *T. maximus* was collected only in eastern Tennessee (Fig. 5).

Xiphinema. Xiphinema americanum appears to be ubiquitous to the state, and all specimens of *Xiphinema* observed in this study were identified as this species. Lamberti and Bleve-Zacheo (1979) recently described *X. tenuicutis* from near the Anderson-Roane county line.

In addition to the species listed in Table 3, several others are known from Tennessee through interception in interstate plant shipments from Tennessee to California (Siddiqui **et al.**, 1973). Those species intercepted but not found in the present study were *Aphelenchoides ritzemabosi* (Schwartz) Steiner & Buhrer associated with spirea; *Pratylenchus brachyurus* (Godfrey) Filipjev & Schuurmans-Stekhoven from maple, poplar, and rose; *P. coffeae* (Zimmerman) Filipjev & Schuurmans-Stekhoven from periwinkle and rose; and *Rotylenchus robustus* (de Man) Filipjev from periwinkle.

DISCUSSION

Many of the more than 70 species listed in this compilation (Table 2) are well-known and widely distributed in North America. Most species recorded from other states occur in Tennessee, as well.

Fifteen of 20 species (75%) listed from Kentucky (Chapman, 1957) were recorded from Tennessee in this study. Percentages of nematode species of most other states and also occurring in Tennessee are lower but similar: 52% for Kansas (Orr & Dickerson, 1966) and Texas (Norton, 1959), 57% for New Jersey (Hutchinson **et al.**, 1961), 60% for Maryland (Jenkins **et al.**, 1957), and 75% for Oregon (Jensen, 1961). However, only 47% of species recorded from Louisiana (Birchfield, **et al.**, 1979) and 42% of those listed from North Dakota (Donald & Hosford, 1980) were also found in Tennessee.

Comparisons of species in Tennessee with those of the above states are not valid because of refinements in biosystematics and the extraction techniques now used. However, in comparison with an extensive California survey (Siddiqui **et al.**, 1973), 58% of plant-parasitic nematodes collected from Tennessee were also found in California. Broader and more rigorous survey programs may help identify climatic and geographic factors which limit nematode distributions to certain states or regions. The human role in nematode geographical spread may also be more closely defined by analysis of species distribution.

Species diversity appeared to be greater in certain plant associations (Table 3), due perhaps to greater stability of the associations or to more intensive sampling. Turf associations, which probably included unidentified weeds, accounted for 33 nematode species. Other diverse associations included field crops (24 spp.), woody ornamentals (22 spp.) and commercial vegetables (20 spp.).

Considering previously known nematode distributions, the presence of some species is difficult to explain. For example, *Helicotylenchus anhelicus* was previously known only from California (Sher, 1966). *Trophonema arenarium* was also found in California on salt rush and on other plants (Raski, 1956; Siddiqui **et al.**, 1973) yet this or a very similar species was extracted from soil under an ornamental holly in north-central Tennessee. The problem of such strongly disjunct populations can be solved only by intensive and thorough sampling of many plant associations.

A compilation of plant-parasitic nematode distribution and abundance can help researchers develop priorities for future studies. Some species, such as *H. pseudorobustus*, *M. incognita*, *P. scribneri*, *Q. acutus*, and *X. americanum*, occur throughout Tennessee in many crop associations, and may be considered pests of general interest.

Others (*H. glycines*, *P. vulnus*) are important pathogens of relatively few plant species, and some (*M. hapla*, *P. penetrans*, *R. buxophilus*) are significant pests in other regions of the country. Thus, information acquired through a faunistic survey may help define regional problems by demonstrating the importance and ubiquity of selected plant-parasitic nematodes.

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