SCOPE OF NEMATODES RESEARCH IN FORESTRY

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Nematodes may damage forest plantations which are usually established on poorly stocked natural forest areas, or planted on areas which have been recently cleared out, or on abandoned farm-land. Changing to closely spaced planting of tree species susceptable to nematodes may promote an increase in the nematode population that result in an unacceptably large decrease in rate of growth. Nematode diseases are one of the causes of poor crop yield on the old farmlands and contributed to their abandonment.

Knowledge of nematode diseases of natural forest stands is lacking. Large trees growing through out vast areas on diverse sites and mixed with various other plant species are difficult to study. The undisturbed soil in natural woodlands is a biotic complex that tends to persist in indefinitely in equilibrium. The growth rate of mature trees is slowed by age, and individual trees are commonly attacked by wood destroying fungi and insects. The mixture of tree species and age classes with in species create condition that tend to discourage the build up of nematodes specific to a given host.

Parasitic nematodes in natural forest soils rearly find conditions suitable for their development beyond maintenance levels and they occasionally become sufficiently abundant to damage trees seriously. Adverse changes in the temperature and moisture over extended periods, however could decrease the growth of trees and accelerate the activities of certain nematodes to a point where serious problem could evolve.

Nematodes important to forestry are diverse in type and form. One group of nematodes parasitizes insect pests, some nematodes feed directly on aerial parts of the plants, others feed only on other organisms inhabiting the rhizosphere of the tree. One particular association is the group of fungus feeders that parasitizes mycorhizal symbionts. Finally there are nematodes that feed directly on tree roots.

Nematodes parasitic on tree insects

Massay (1966) reviews many of the nematode parasites of forest insects. These nematode parasites are important to the forest industry because they kill or weaken the timber boring beetles and the defoliating larvae of Hymenoptera and Lepidoptera. These nematodes may be useful in biological control of these important insect pests.

Nematodes parasitic on aerial parts of trees.

Nematodes parasitic on the aerial parts of forest trees are usually limited to tropical regions, but in Beligium an infection by *Aphelenchoides fragariae* in cuttings of *Ficus* spp.

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in greenhouse propagation beds watered daily was reported by De Maeseneer (1964 b). Infection by *Aphelenchoides besseyian* on *Ficus elastica* in open field in Southren Florida caused discolored lesions in the interveinal leaf tissue and rendered unsalable these plants, sought for their attractive, distinctive foliage (Marlatt, 1966). In Mysore, India an unidentified species of *Aphelenchoides* caused a bud rot of Areca palms in which infected trees became thin crowned, gradually shed their leaves and finally died. (Thirumalacher 1946). Van Hoof and Seinerhost (1962) reported *Rhodinaphelenchus cocophilus* consistantly associated with little leaf symptoms of oil and coconut palm in Surinam and British Guiana where nematodes were commonly retarding the development of young leaves in which they occurred. This nematode also causes a severe disease of oil palm, *Elacis guineensis* in Venezuela.

Nematode diseases in forest nurseries

Forest nurseries with continuous and intensive cultivation of the same or similar plant species within the same area are similar to certain agronomic monoculture system which have been plagued by nematode diseases. The crop of the tree seedling is as valuable as tomato or tobacco grown in seed beds and considerable attention and capital can be economically invested to control nematode diseases in such areas. It is not clear when the first nematode investigation was made in nursery seedlings. However in 1932 Yamaguchi recorded his discovery of *Pratylenchus* sp. parasitizing the roots of *Picea* spp. in a Japanese nursery, and in the early 1940s Stenier (1949) found nematodes invading roots of pine seedlings in several nurseries in Florida, USA. Since then, both endoparasitic and ectoparasitic nematodes have been found commonly associated with unthrifty and stunted nursery seedlings in various parts of the world. Henry (1953) found a few parasitic nematodes in the roots of *Pinus elliotti*, *P. palustris*, *P. echinata* and *P. taeda* seedlings in Mississippi, USA and he stated that there were too few nematodes to account for the amount of root damage. Weischer (1956) found brown root lesion on conifers growing in nematode infested areas. Stunted and yellow seedlings of *Picea*, *Pinus*, and *Larix* species in nurseries in certain areas of Austria and Germany (Immel, 1957, Donaubauer, 1959) were probably due to nematode damage, *Rotylenchus robustus*, *Protylenchus penetrass*, *Tylenchorhynchus* sp. and *Ditylenchus* sp. were commonly associated with diseased seedlings (Nottle and Dieter 1957) and the same species of nematodes caused root damage on *Pinus monotana mughus*, *Picea pungens*, *P. abies* and *P. sitchensis* (Riihm, 1959). *Rotylenchus robustus* also caused damage to *Pinus* sp. seedlings in nurseries in the Netherlands (Oostenbrink 1958).

Hopper (1958) made a survey of thirty five nurseries in the southern USA to obtain information in the relationship between parasitic nematodes and the growth of southern pines. *Meloidodera floridensis*, *Tylenchorhynchus claytoni* and *Tylenochorhynchus* sp. were associated with stunted and unthrifty pine seedlings. *M. floridensis* was found in the roots of *Pinus clausa*, *P. nigra* and *P. taeda* but caused severe damage only on *P. clausa*, in the Florida nursery.

Shah and Chaudhry (1975) reported fifteen genera of plant parasitic nematodes belonging to the order Tylenchida found in the soil and roots of Eucalypts saplings in Silvicultural Research Plots at the Pakistan Forest Institute, Peshawar, Forest Plantation at Jallo,

Chichawatni and Changa Manga, and in Eucalypts plantation in Watershed Management Poject area at Garhi Habibullah, Hazara. Nine genera of ectoparasitic nematodes and some free living nematodes were also recovered. The percentage of the plant parasitic nematodes of the genera, "*Rotylenchus*, *Paratylenchus*, *Pratylenchus*, *Helicotylenchus* and *Tylenchorhynchus* was quite high amongst the parasitic nematodes extracted from the soil and root samples of Eucalypts saplings at Chichawatni and Garhi Habibullah. Other plant parasitic nematodes belonging to the order Tylenchida infesting Eucalypts roots at previous places were *Ditylenchus*, *Criconemoides*, *Aphelenchus*, *Aphelenochoides*, *Rotylenchulus*, *Psilenchus*, *Tylenchus*, *Paurodontus*, *Boleodorus* and *Nothotylenchus*. The ectoparasitic genera belonging to the order *Dorylaimidia* were *Longidorus Nygolaimus*, *Labronema*, *Dorylaimus Discolaimus*, *Discolaimum*, *Tylencholaimus*, *Aulolaimus* and *Carcharolaimus*, and many free living nematodes belonging to the order Rhabditida.

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