

STUDIES ON THE POPULATION FLUCTUATIONS OF SOIL NEMATODES ASSOCIATED WITH BANANA IN KERALA STATE

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Little information is available in this country on the influence of the various factors relating to soil and seasons on the population of the soil inhabiting nematodes. The only observation of this type appears to be that of Prasad and Chawla (1965) on the Citrus Nematode.

Banana (including the different varieties of plantain) is extensively grown throughout the State of Kerala in all the different types of soils. Nair *et al* (1966) recorded the occurrence of *Radoph'us similis* in this State infesting banana roots. The detection of the presence of this notorious nematode stimulated the work presented hereunder which covered a study of the different types of nematodes occurring in association with banana and the fluctuations of their populations in relation to the soil types, seasons (rainy and dry) and whether the plants were infested by the bunchy top virus or healthy.

Material and Methods

Soil and root samples (120 each) were collected from 15 localities between Trichur in the north and Vellayani in the south, from depths of 4-7 inches, from the base of healthy and diseased plants during rainy and dry seasons and from 5 types of soils, viz., laterite, sandy, loam, clay and

clayey loam. Nematodes were extracted from the soil samples (of 500 g each) by the method of Christie and Perry (1951) and from the root samples (of 20 g each) by homogenising them in a waring blender with adequate quantities of water. For counting the nematodes the extracts in water were poured into counting dishes and the total number of nematodes counted under a binocular microscope.

Results

Types of nematodes infesting banana: The parasitic forms observed are *Radoph'us similis* (Cobb 1893) Thome 1949, *Helicotylenchus* sp., *Rotylenchus* sp. and *Criconemoides* sp. *R. similis* is distributed in the region between Trichur in the north and Chengannur in the south, inhabiting laterite, clayey and clayey loam soils; it is absent south of Chengannur. *Helicotylenchus* sp and *Rotylenchus* sp, are present universally in all the localities and soil types studied. *Criconemoides* sp has been detected in Trivandrum only. There is also a large fauna of non-parasitic forms in the soil which include rhabditids and dorylaimids.

Population of parasitic nematodes in soil: Statistical analysis of the data shows

significant differences in the nematode population between the different types of soils, between the two seasons and between the healthy and diseased plants. There exists no interaction between these 3 factors indicating that their effects are independent. Table 1 shows that loamy and sandy soils support the largest popu-

lations of the parasites while the other types support very low populations. From Table 2 it may be observed that the population of the parasitic nematodes is significantly higher in the soils of the bunchy-top affected plants than in those of the healthy plants and high in the rainy season than in the dry season.

Table 1

Mean number of parasitic nematodes in 500 g of soils of different types.

Soil type	Mean number
Loamy	81.6
Sandy	89.3
Laterite	42.2
Clay	31.1
Clay loam	33.5
C. D. (0.05)	36.28

Table 2

Mean number of parasitic nematodes in 500g of soils in different seasons and of different conditions of plants.

Plant condition	Rainy season	Dry season	Mean
Healthy	57.3	20.9	39.1
Diseased	102.5	41.5	72.0
Mean	79.9	31.2	

Population of parasites in roots: Significant influence of the soil types, seasons and plant conditions on the population of the parasitic forms within the roots is indicated in statistical analysis. From Table 3 it

may be seen that the roots in the clay loam soils have the highest parasite population while the roots in the loamy soils harbour a low population.

Table 3

Mean number of parasitic nematodes in 20 g of banana roots in the different soil types.

Soil type	Mean number
Loamy	43.5
Sandy	87.9
Literite	87.0
Clay	81.0
Clay loam	107.1
C. D. (0.05)	12.42

Table 4

Mean number of parasitic nematodes in roots in different seasons and of plants of different conditions.

Plant condition	Rainy season	Dry season	Mean
Healthy	55.8	78.0	66.9
Diseased	80.4	111.0	95.7
Mean	68.1	94.5	—

Table 4 shows that the root population of the parasites is significantly more during the dry season than during the rainy season. This may be due to more of the nematodes invading the roots to avoid the adversities of the dry soil. Further, the

roots of the diseased plants support a significantly higher population than those of the healthy plants. The virus (bunchy top) infected condition of the plant thus appears favourable for the population build-up of the parasites.

Table 5

Mean number of non-parasitic nematodes in 500 g of soil of banana in the different soil types.

Soil type	Mean number
Loamy	121.4
Sandy	140.0
Laterite	179.6
Clay	96.6
Clay loam	136.2
C. D. (0.05)	37.22

Table 6

Mean number of non-parasitic nematodes in 500 g of soil of banana of different conditions and in different seasons.

Plant condition	Rainy season	Dry season	Mean
Healthy	172.1	89.7	130.9
Diseased	179.7	97.4	138.6
Mean	175.9	93.9	—

Population of non-parasitic nematodes in soil • Results summarised in Table 5 show significant difference in the extent of the nematode population in the different soil types, the laterite soil supporting the highest population followed in the descending order by the sandy, the clay loam, the loam and clay soils. From

Table 6 it may be observed that seasons also significantly affect the nematode population, it being higher in the rainy season than in the dry season. There is, however, no significant difference in the population in relation to the plant conditions,

Summary

Studies made of the soil nematodes associated with banana in Kerala in relation to the soil types, seasons and the healthy or diseased (bunchy top infected) conditions of the plants have yielded the following information : —

Radopholus similis, *Helicotylenchus* sp., *Rotylenchus* sp. and *Criconemoides* sp. are the parasitic nematodes found associated with banana; there are several non-parasitic species also.

The population of the parasitic nematodes is high in the sandy and loamy soils and low in the lateritic, clayey and clayey loam soils; the root population of the parasites on the other hand is high in clayey loam and low in loam.

Both the foil and root populations of the parasites are more in association with the bunchy-top infected plants than with the healthy plants.

The soil population of the parasites is significantly more during the wet seasons than during the dry seasons; the root population is, however, more during the dry seasons than during the wet seasons.

The population of the non-parasitic forms in soil is maximum in lateritic soils and least in clayey soils and is significantly higher in the rainy seasons than in the dry seasons; it is not affected by the healthy or diseased condition of the plants.

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