

Temporal pattern of plant parasitic nematodes associated with Red Sanders, *Pterocarpus santalinus* during the month from June' 04 to June' 05 at Sennamalaikaradu, Mettupalayam

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Abstract: Forest tree species have wide application and usage including bioremediation to reduce pollution, conservation of biodiversity, to meet rural and industrial demand, preserving valuable germplasm and wasteland development programme. Diseases caused by nematodes have just begun to recognise as a significant forestry problem. Nematode damage, being density dependant one, becomes visible only when nematode population exceeds critical threshold of economic damage. Information on disease and nematode population dynamics in natural forest stands in Tamil Nadu is quite scanty. Therefore, realizing the importance of nematodes in forest plantation, a study to assess the temporal pattern of plant parasitic nematodes associated with Red Sanders, *Pterocarpus santalinus* plantation was carried out during June' 04 to June' 05 at Sennamalaikaradu, Mettupalayam, Coimbatore. The plantations was divided into four quarters as A, B, C and D and in each quarter 5 composite soil core and roots were collected from 4 trees of 20 years old plantations at 60 cm depth at a distance of 90 cm from the tree base at monthly intervals to observe nematode population. The data on weather parameters were also collected from the Farm Observatory of Forest College and Research Institute, Mettupalayam in order to find out its influence on nematode reproduction and multiplication. The observations recorded for a period of one year from June' 04 to May' 05 showed the presence of soil and root population of parasitic nematodes viz., *Helicotylenchus dihystera*, *Hoplolaimus seinhorsti*, *Meloidogyne incognita* and *Tylenchorynchus mashoodi* on Red Sanders (*P. santalinus*) plantation. In soil the population of *H. dihystera* and *H. seinhorsti* were found to be maximum in number i.e., 35.2 and 14.6 per 200 g soil, respectively during the month of October' 04 followed July' 04 and August' 04 due to receipt of heavy rainfall ranging from 45.0 to 233.3 mm during these months. Regarding root, the population of *H. dihystera* was 8.79 per 5 g root and that of *H. seinhorsti* was 7.3 per 5 g of root during the month of October' 04.

Key words: Red sander, nematode population, temporal pattern.

Introduction

Forest tree species have wide application and usage including developing biopesticides, bioremediation to reduce pollution, conservation of biodiversity, industry, wood production, tree-based agribusiness, to meet rural demand, preserving valuable germplasm and wasteland development programme. Wherever monoculture is practiced for too long, the nematode problem is likely to appear. Each year, there is more evidence to support this evidence (Mai, 1985).

Diseases caused by nematodes have just begun to recognise as a significant forestry problem. Nematode damage, being density dependant one, becomes visible only when nematode population exceeds critical threshold of economic damage. Forest plantations, usually planted on poor soil or abandoned farmlands, may be affected by nematode disease easily. Information on disease and nematode population dynamics in natural forest stands in Tamil Nadu is quite scanty.

The most classical example of nematode species causing tremendous losses in forestry is *Bursaphelenchus xylophilus* which causes pine wilt disease in Japan, Canada, U.S.A., China, Norway, Sweden, and Finland. The annual loss due to the nematode to pines during 1981 amounted to two million m³ with the death of ten million trees in Japan (Mamiya, 1983). In Philippines. *M. incognita* was found to cause stunting in *Anthocephalus chinensis* Rich. (Kadam), which in turn affected the paper industry of the country (Postrado and Glori, 1968).

Therefore, realizing the importance of nematodes in forestry, a study was carried out to assess the temporal pattern of plant parasitic nematodes associated with Red Sanders, *Pterocarpus santalinus* plantation during June' 04 to June' 05 at Sennamalaikaradu. Mettupalayam, Coimbatore.

Table 1. Rainfall, temperature and humidity for June' 04 to May' 05 at Forest College and Research Institute. Mettupalayam

Month and year	Rainfall (mm)	Max. temp (°C)	Min. temp (°C)	Relative humidity (%)
June 2004	52.0	33.2	21.2	82.5
July 2004	45.0	32.5	20.1	86.8
August 2004	27.1	31.48	22.51	89.9
September 2004	89.5	32.9	22.2	82.5
October 2004	233.3	31.2	21.2	85.8
November 2004	146.0	28.9	19.8	91.2
December 2004	-	30.3	16.2	88.6
January 2005	22.0	32.1	17.9	86.7
February 2005	45.0	32.6	17.7	89.9
March 2005	12.6	35.9	21.3	79.9
April 2005	12.1	32.7	23.3	80.3
May 2005	24.0	36.2	24.0	80.5

Table 2a. Population of different ectoparasitic nematodes on *Pterocarpus santalinus* plantations

Month and year	<i>Helicotylenchus dihystra</i>										<i>Hoplolaimus seinhorsti</i>									
	Soil population / 200g					Root population /5g					Soil population /200g					Root population /5g				
	A	B	C	D	Mean	A	B	C	D	Mean	A	B	C	D	Mean	A	B	C	D	Mean
Jun 04	16.00	15.33	24.00	20.33	18.92	4.JJ)	4.00	6.33	5.33	5.00	4.33	2.33	2.67	2.33	2.92	2.33	1.33	1.67	1.33	1.67
Jul. 04	24.67	18.67	40.00	29.33	28.17	6.33	5.00	10.33	7.33	7.25	5.33	2.67	3.67	4.33	4.00	3.00	1.67	2.33	2.33	2.33
Aug. 04	27.00	19.33	43.67	32.67	30.67	6.66	5.00	11.33	8.00	7.75	6.00	2.67	4.33	5.00	4.50	3.00	1.33	2.33	2.67	2.33
Sept. 04	19.33	19.67	30.67	24.67	23.58	5.00	5.00	7.67	6.33	6.00	3.00	3.67	4.67	4.00	3.83	1.67	2.33	2.33	2.33	2.17
Oct. 04	32.67	35.67	40.67	31.67	35.17	8.33	9.00	10.33	8.00	8.92	12.33	17.00	14.33	14.67	14.58	6.33	8.67	7.33	7.67	7.50
Nov. 04	26.33	27.33	33.67	27.00	28.58	6.67	7.00	8.67	7.00	7.34	7.67	6.33	11.00	10.00	8.75	4.00	3.33	5.67	5.33	4.58
Dec. 04	15.33	20.67	23.00	16.33	18.83	4.00	5.33	6.00	4.33	4.92	6.67	5.33	10.00	8.67	7.67	3.67	3.00	5.33	4.67	4.17
Jan. 05	11.00	13.00	17.33	15.67	14.25	3.00	13.00	4.33	4.00	6.08	7.00	6.33	9.33	8.00	7.67	3.67	3.33	5.00	4.33	4.08
Feb. 05	10.00	10.33	14.00	13.00	11.83	2.67	2.67	3.67	3.33	3.09	7.67	5.33	7.00	6.67	6.67	4.00	3.00	3.67	3.67	3.59
Mar. 05	12.00	13.00	14.33	13.67	13.25	3.00	3.33	3.67	3.67	3.42	5.00	4.00	7.00	6.67	5.67	2.67	2.33	3.67	3.67	3.09
Apr. 05	13.00	13.00	15.33	16.00	14.33	3.33	JJJ	4.00	4.00	3.67	6.33	3.00	4.67	5.33	4.83	3.33	1.67	2.33	3.00	2.58
May. 05	11.00	11.00	13.67	14.33	12.50	3.00	3.00	3.67	3.67	3.34	3.00	4.67	3.00	3.33	2.75	1.67	1.00	1.67	2.00	1.59
		l	m	l x m			l	m	l x m			l	m	l x m			l	m	l x m	
SEd		0.46	0.79	1.58			0.13	0.23	0.46			0.25	0.44	0.88			0.15	0.26	0.52	
CD (0.05)		0.90	1.57	3.13			0.27	0.46	0.92			0.50	0.87	1.75			0.30	0.52	1.04	

Table 2b. Population of different ectoparasitic nematodes on *Pterocarpus santalinus* plantations (continued)

Month and year	<i>Meloidogyne incognita</i>					<i>Tylenchorhynchus mashoodi</i>														
	Soil population / 200g					Root population /5g					Soil population /200g					Root population /5g				
	A	B	C	D	Mean	A	B	C	D	Mean	A	B	C	D	Mean	A	B	C	D	Mean
Jun.04	2.00	2.33	3.33	2.67	2.58	0.00	0.00	0.00	0.00	0.00	2.00	1.67	2.33	2.33	2.08	0.00	0.00	0.00	0.00	0.00
Jul. 04	2.67	3.33	3.67	3.33	3.25	0.00	0.00	0.00	0.00	0.00	2.33	2.33	2.67	2.67	2.50	0.00	0.00	0.00	0.00	0.00
Aug. 04	2.67	3.00	4.00	3.67	3.33	0.00	0.00	0.00	0.00	0.00	2.67	2.33	3.33	3.00	2.83	0.00	0.00	0.00	0.00	0.00
Sept. 04	4.00	3.33	4.67	4.33	4.08	0.00	0.00	0.00	0.00	0.00	3.00	2.67	4.67	4.33	3.67	0.00	0.00	0.00	0.00	0.00
Oct. 04	6.33	4.67	8.00	6.33	6.33	0.00	0.00	0.00	0.00	0.00	5.33	3.00	6.67	5.67	5.17	0.00	0.00	0.00	0.00	0.00
Nov. 04	6.67	4.67	8.33	6.00	6.42	0.00	0.00	0.00	0.00	0.00	4.00	3.33	6.00	5.33	4.67	0.00	0.00	0.00	0.00	0.00
Dec. 04	5.33	4.00	7.00	5.67	5.50	0.00	0.00	0.00	0.00	0.00	3.00	2.67	5.00	3.67	3.58	0.00	0.00	0.00	0.00	0.00
Jan.05	6.33	5.00	7.00	6.33	6.17	0.00	0.00	0.00	0.00	0.00	4.33	3.67	4.67	5.00	4.42	0.00	0.00	0.00	0.00	0.00
Feb.05	4.67	4.33	6.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	2.67	3.00	4.33	4.00	3.50	0.00	0.00	0.00	0.00	0.00
Mar. 05	4.33	4.00	4.67	4.67	4.42	0.00	0.00	0.00	0.00	0.00	2.67	3.00	3.67	3.67	3.25	0.00	0.00	0.00	0.00	0.00
Apr. 05	3.33	3.00	3.67	3.67	3.42	0.00	0.00	0.00	0.00	0.00	3.00	3.00	3.00	3.00	3.00	0.00	0.00	0.00	0.00	0.00
May. 05	1.66	1.33	1.67	1.67	1.58	0.00	0.00	0.00	0.00	0.00	1.67	1.67	2.33	1.33	1.75	0.00	0.00	0.00	0.00	0.00
		l	m	l x m			l	m	l x m			l	m	l x m			l	m	l x m	
SEd		0.19	0.33	0.67			0.00	0.00	0.00			0.17	0.29	0.57			0.00	0.00	0.00	
CD (0.05)		0.38	0.66	1.32			0.00	0.00	0.00			0.33	0.57	1.14			0.00	0.00	0.00	

Materials and Methods

A field observation was recorded to study the population pattern of different parasitic nematodes associated with Red Sanders. *Pterocarpus santalinus* during different part of a year from June' 04 to May' 05 at Sennamalaikaradu, Mettupalayam. The plantation was divided into four quarters as A, B, C and D and in each quarter 5 composite soil core and roots were collected from 4 trees of 20 years old plantations. Composite root and soil samples were drawn from four trees individually at 60 cm depth at a distance of 90 cm from the tree base at monthly intervals. A composite root sample of 5 g from each tree was stained with acid-fuchsin lactophenol and cleared in plain lactophenol and observed for nematode population. Similarly a composite soil sample of 200 g was processed by Cobb's decantation and sieving followed by modified Baermann's funnel method and assayed for nematode populations. The data on weather parameters were also collected from the Farm Observatory of Forest College and Research Institute, Mettupalayam in order to find out its influence on nematode reproduction and multiplication.

Table 2c. Population of different ectoparasitic nematodes on *Pterocarpus santalinus* plantations (continued)

Month and year	<i>Helicotylenchus dihystrera</i>		<i>Hoplolaimus seinhorsti</i>		<i>Meloidogyne incognita</i>		<i>Tylenchorynchus mashoodi</i>	
	Population		Population		Population		Population	
	Per 200g soil	Per 5 g root	Per 200g soil	Per 5 g root	Per 200g soil	Per 5 g root	Per 200g soil	Per 5 g root
Jun. 04	18.92	4.73	2.92	1.46	2.58	0.00	2.08	0.00
Jul. 04	28.17	7.04	4.00	2.00	3.25	0.00	2.50	0.00
Aug. 04	30.67	7.67	4.50	2.25	0.00	2.83	0.00	
Sept. 04	23.58	5.90	3.83	1.92	4.08	0.00	3.67	0.00
Oct. 04	35.17	8.79	14.58	7.29	6.33	0.00	5.17	0.00
Nov. 04	28.58	7.15	8.75	4.38	6.42	0.00	4.67	0.00
Dec. 04	18.83	4.71	7.67	3.83	5.50	0.00	3.58	0.00
Jan. 05	14.25	3.56	7.67	3.83	6.17	0.00	4.42	0.00
Feb. 05	11.83	2.96	6.67	3.33	5.00	0.00	3.50	0.00
Mar. 05	13.25	3.31	5.67	2.83	4.42	0.00	3.25	0.00
Apr. 05	14.33	3.58	4.83	2.42	3.42	0.00	3.00	0.00
May. 05	12.50	3.13	2.75	1.38	1.58	0.00	1.75	0.00
SEd	1.58	0.46	0.88	0.52	0.67	0.00	0.57	0.00
CD (0.05)	3.13	0.92	1.75	1.04	1.32	0.00	1.14	0.00

Temporal pattern of plant parasitic nematodes associated with Red Sanders, *Pterocarpus santalinus* during ...

Results and Discussion

The observations recorded for a period of one year from June '04 to May '05 showed the presence of soil and root population of parasitic nematodes viz., *Helicotylenchus dihystera*, *Hoplolaimus seinhorsti*, *Meloidogyne incognita* and *Tylenchorynchus mashoodi* on Red Sanders (*P. santalinus*) plantation at Sennamalaikaradu. Mettupalayam.

The key nematode populations observed were the spiral nematode, *Helicotylenchus dihystera* followed by the lance nematode, *Hoplolaimus seinhorsti*. The root-knot nematode, *M. incognita* and stunt nematode, *T. mashoodi* were found to be less in number ranging from 2 to 6 per 200 g soil (Table 2). The population of *H. dihystera* and *H. seinhorsti* were found to be maximum in number i.e., 35.2 and 14.6, respectively during the month of October '04 followed July '04 and August '04 due to receipt of heavy rainfall ranging from 45.0 to 233.3 mm during these months (Table 1).

Regarding root, the population of *H. dihyseru* was 8.79 per 5 g root and that of *H. seinhorsti* was 7.3 per 5 g of root during the month of October '04. Minimum number of *Meloidogyne* spp. was found in soil (2 to 6 per 200 g) with less number of galls or larvae on root system (Table 2).

The study was made to find out the temporal distribution pattern of parasitic nematodes associated with 20 year old red sanders. *P. santalinus* plantation at Sennamalaikaradu, Mettupalayam for a period of one year from June '04 to May '05 (Fig. 1). During the above study period, the population of *H. dihystera* and *H. seinhorsti* were found to be maximum in number in

the months of July, August and October '04 due to receipt of rainfall ranging from 45 to 233.3 mm (Fig. 2). Since rapid multiplication of *H. seinhorsti* occurs on *P. santalinus*, *Meloidogyne* population even though available in soil could not multiply on *P. santalinus*. Similar observation was reported in the study of dynamics of concomitant population of *H. columbus* and *M. incognita* on cotton, wherein simultaneous inoculation of *H. columbus* with *M. incognita* increased *H. columbus* alone both at 60 and 90 days after inoculation and most larvae of *M. incognita* inoculation did not develop to maturity in the presence of *H. columbus* (Schmidt and Lewis, 1981). Based on the above pathogenicity study and observations recorded on red sanders plantation it is confirmed that *H. seinhorsti* is a pathogenic nematode species on *P. santalinus*.

Similarly, Baghel and Bhatti (1982) reported that on Citrus the number of *H. indicus* increased from April to May. Maximum population of *H. indicus* on peach in April (Saxena *et al.*, 1972) on grasslands in West Bengal during July (Mukhopadhyaya *et al.*, 1982) and on rice during high rainfall season (Ramana and Rao, 1978) have been correlated with the production of new feeder roots. Sabir (2000) recorded *H. indicus* on *Carica papaya* throughout the year with a density level of 40-110 nematodes.

The soil population of *H. dihyseru* and *H. seinhorsti* was found to be maximum in number, (35.17 and 14.58, respectively) on *Pterocarpus santalinus* in the plantation of Sennamalaikaradu, Mettupalayam during the month of October '04. The population of nematode was higher during July '04 and August '04 due to the receipt of heavy rainfall.

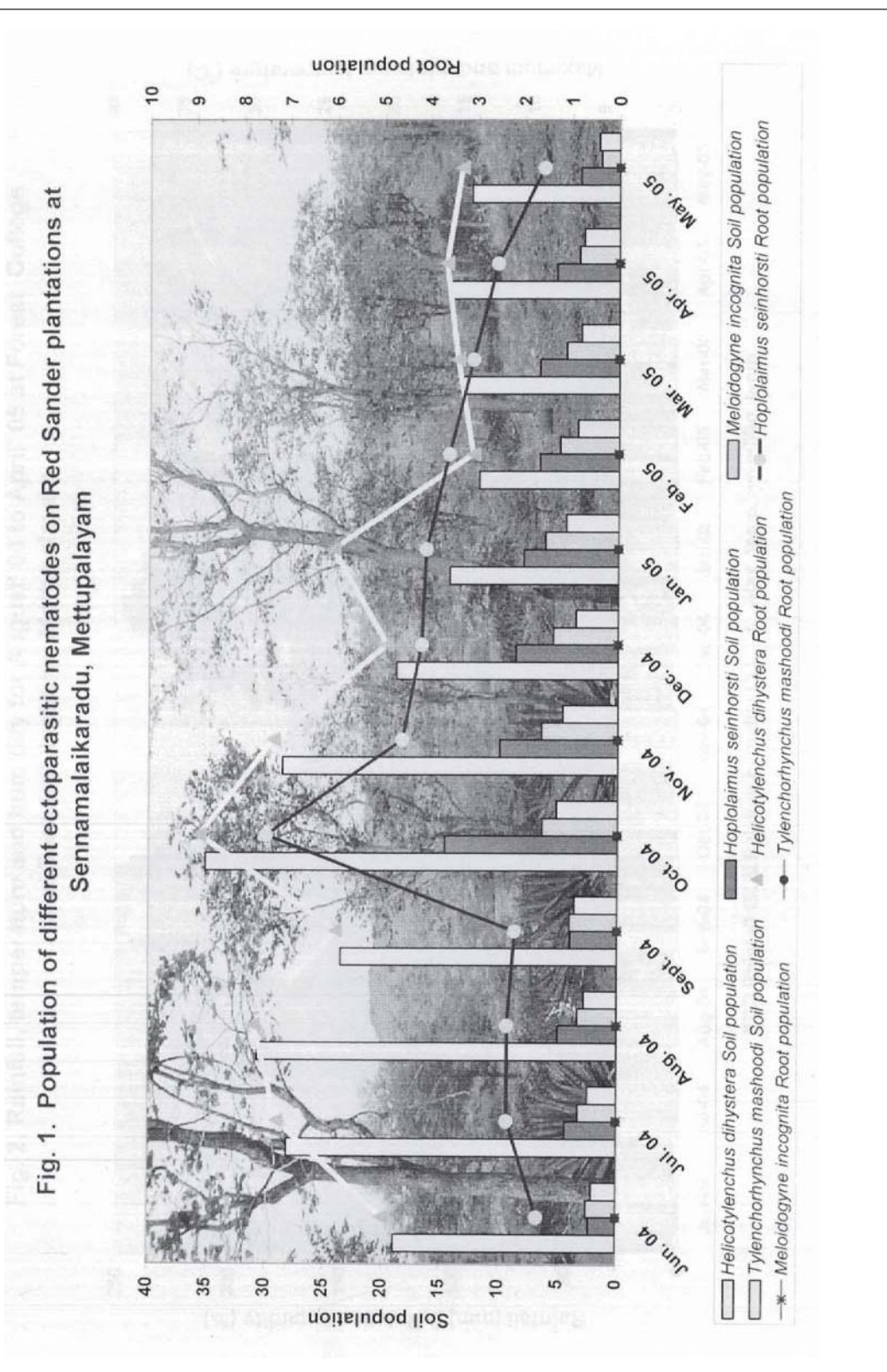
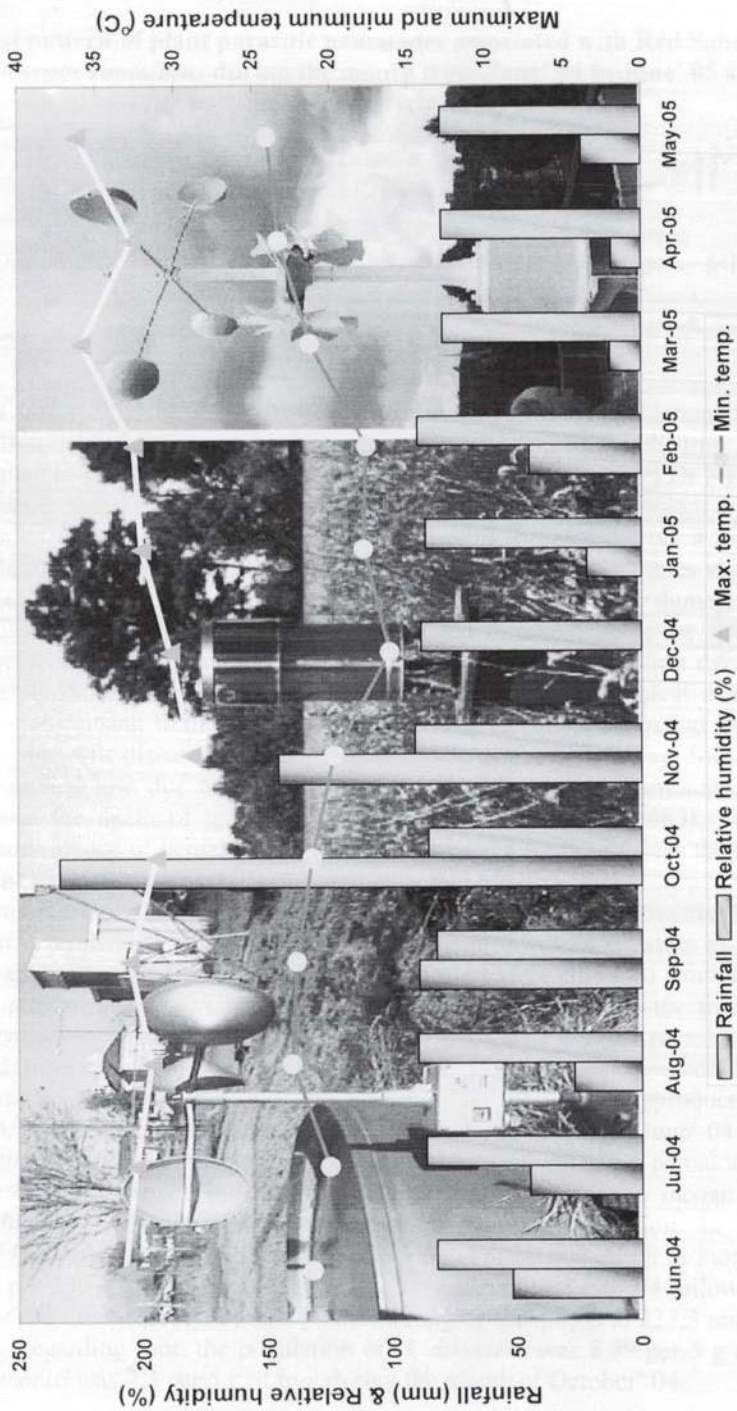


Fig. 2. Rainfall, temperature and humidity for August' 04 to April' 05 at Forest College and Research Institute, Mettupalayam



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