

Rec. zool. Surv. India : 110(Part-2) : 89-93, 2010

STUDIES ON THE SEASONAL FLUCTUATION OF SOIL NEMATODES POPULATION IN SANDY AND LATERITE SOIL OF BALASORE AND MAYURBHANJ DISTRICTS OF ORISSA

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INTRODUCTION

The soil in a particular area contains various organic and inorganic matter and supports a number of plants and animals including micro organisms. Usually nematodes both free living and plant parasitic exist in communities containing many species which exhibit efficient dispersal, polyphagy, weak interspecific competition. As most of the workers like Choudhury (1985), Choudhury and Phukan (1990, 1992), Roy and Parija (1987), Khan and Sharma (1990), Khan *et al.* (1980), Khan, Adhami and Saxena (1971), Sabir (2000), Srivastava *et al.* (2000), Dwivedi and Upadhyay (2001), De *et al.* (2004), Sen *et al.* (2008) studied the population structure of soil nematodes associated with the different crops. Very few workers like Nilova (1961), Khakinov (1971), Das and Mukhopadhyay (1990), Choudhury and Sivakumar (1999), studied the population fluctuation and vertical distribution of soil nematodes in cultivated and uncultivated soil and in different soil types. So an attempt was made to study the population structure together with the vertical distribution of the soil nematodes present in sandy and laterite types of soil in Balasore and Mayurbhanj districts of Orissa.

MATERIALS AND METHODS

The present study was undertaken during 2005-2006 in the specific areas of Balasore and Mayurbhanj districts of Orissa. In the Balasore district the soil is sandy in nature and in the forest area of Mayurbhanj district the soil is of laterite type. Four surveys were undertaken in January, March, July and November, 2006. Collections were mainly made from the grass land and paddy field after harvest in the Balasore district and

from the forest areas of the Mayurbhanj district. Collections were made in two depths one from 0 to 10 cm and other from 10-20 cm to study the vertical distribution. For the assessment of the nematode population 250 c.c. of soil samples were processed by sieving and decanting using 250 and 325 mesh and the nematodes were extracted by modified Baermann's funnel technique (Christie and Perry, 1951). The nematodes were counted under low power binocular microscope in a counting dish.

Apart from the extraction of the soil nematodes the soil samples were analysed to determine the pH and moisture content of the soil samples using Systronics pH metre and Infra red moisture balance respectively. Soil temperatures were recorded at the time of sampling the soil by inserting soil thermometer in the soil.

RESULTS AND DISCUSSION

The average moisture content of the sandy soil collected from Balasore district was 7.3%, 15.5% and 12% and that of laterite soil collected from Mayurbhanj district was 3%, 10.5% and 4.5% in premonsoon, monsoon and post monsoon period respectively. The moisture content of the upper and lower layer's soil samples (i.e., 0-10 cm and 10-20 cm depth) shows slight difference in both types of soil. In pre- and postmonsoon collections the moisture content of the lower layer's samples was slightly higher and this difference ranges from 0.5% to 1.5% in pre monsoon and 0.2% to 0.6% in postmonsoon period in sandy soil and in laterite soil it ranges from 0.7% to 0.8% in premonsoon and 1% to 1.2% in post monsoon. But in the monsoon the moisture content of the upper layer

(i.e., 0-10 cm) collections was more higher than that in the lower layer's collection in both types of soil and the difference of moisture content ranges from 2% to 5% and 1% to 3% in sandy and laterite soil respectively. The average soil temperature was 29°C, 28°C and 21°C in sandy soil and 31°C, 28°C and 21°C in laterite soil in pre monsoon, monsoon and post monsoon period respectively. The pH of soil samples were slightly alkaline in nature in both types of soil in all the seasons and it ranges from 7.1 to 7.8 and only the samples collected from paddy field the pH was slightly acedic in nature.

As regards the population of the soil nematodes in two types of soil the total population was always

higher in sandy soil than that in the laterite soil. The average number of soil nematodes in both the layers together (0-20 cm depth) in sandy soil was 42.5, 95 and 48 that in laterite soil was 30.2, 52.5 and 33.2 in pre monsoon, monsoon and post monsoon period respectively.

The vertical distribution of the soil nematodes population in the sandy and laterite soil was also studied and it was observed that the total population was slightly higher in the lower layer (i.e., 10-20 cm depth) in pre monsoon and post monsoon period where as in monsoon the upper layer's population was almost double than that in the lower layer in both types of soil (Table-1).

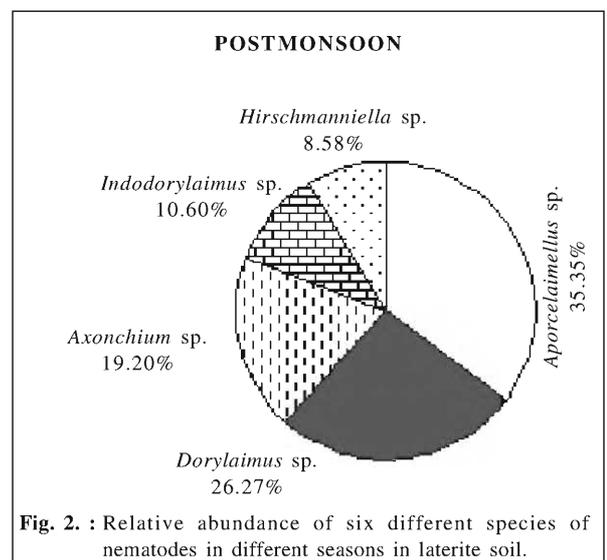
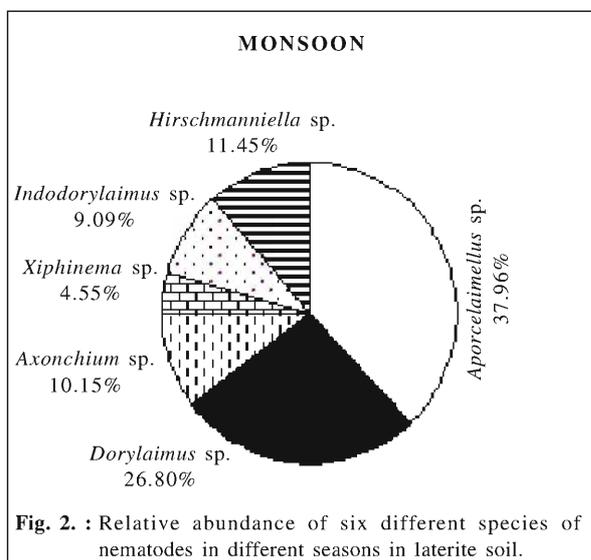
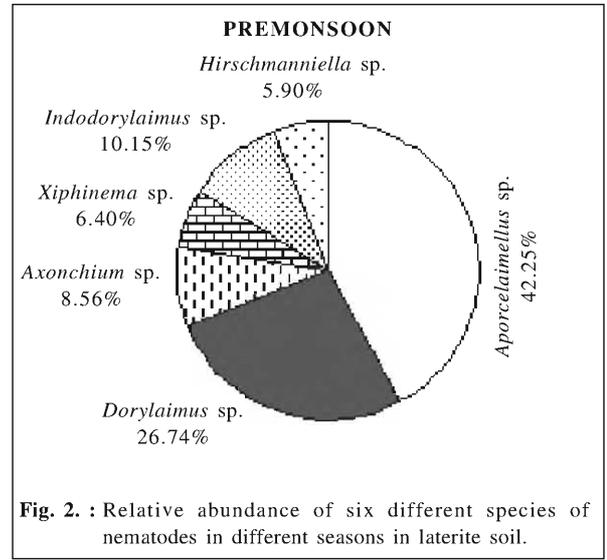
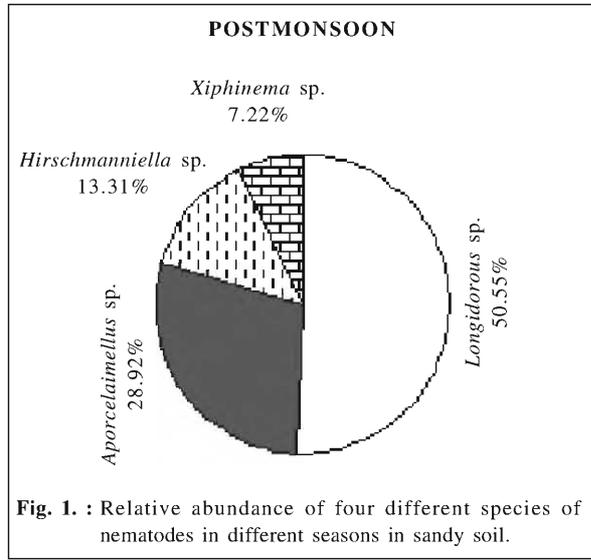
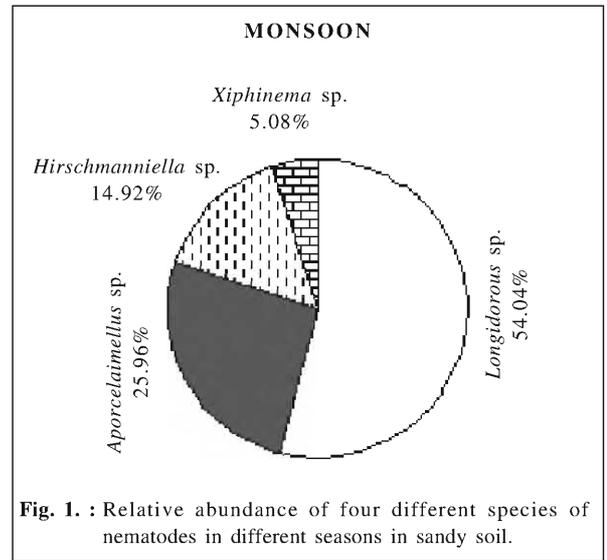
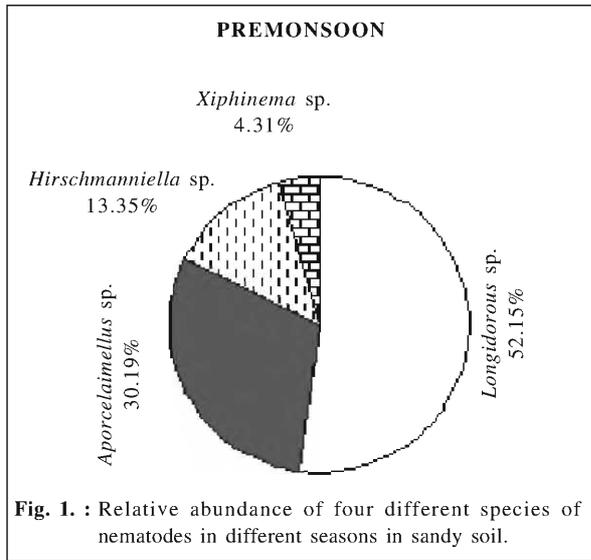
Table-1 : Shows the average soil moisture, pH, soil temperature and nematode population in two types of soil in different seasons.

Particulars	Soil types/Seasons					
	Sandy soil			Laterite soil		
	Pre-monsoon	Monsoon	Post-monsoon	Pre-monsoon	Monsoon	Post-monsoon
Average Moisture (%)	7.3	15.5	12	3	10.5	4.5
Average Temperature (°C)	29	28	21	31	28	21
Average pH	7.1	7.6	7.1	7.3	7.6	7.8
Average Nematode population in 250 ml soil (0-20 cm depth)	42.5	95	48	30.2	55	33.2
Average Nematode population in 250 ml soil in (0-10 cm depth)	16.66	58.16	20.66	12.7	36.25	13.2
Average Nematode population in 250 ml soil in (10-20 cm depth)	25.84	36.84	27.34	17.5	18.75	20

Altogether seven species of nematodes have been identified up to generic level from two types of soil. In the sandy soil only four species are available but in the laterite soil there are six species. In the sandy soil the available species are *Longidorus* sp., *Aporcelaimellus* sp., *Hirschmanniella* sp. And *Xiphinema* sp. and in the laterite soil the available species are *Aporcelaimellus* sp., *Dorylaimus* sp., *Indodorylaimus* sp., *Hirschmanniella* sp., *Axonchium* sp. And *Xiphinema* sp. In the sandy soil *Longidorus* sp. dominated the population occupying about 52.15%, 54.04% and 50.55% of the total population in

premonsoon, monsoon and postmonsoon period where as in the same time *Aporcelaimellus* sp. dominating the population of the laterite soil occupying 42.25%, 37.96% and 35.35% of the total population in the premonsoon, monsoon and post monsoon respectively. In the sandy soil the genus *Aporcelaimellus* occupying the second position but in the laterite soil the second position was occupied by the genus *Dorylaimus* (Fig. 1 & 2).

Many factors are responsible for the seasonal fluctuations of nematodes. Among these fecundity, fertility, duration of life cycle, longevity and substrate



availability are important (Norton, 1978). Along with these factors, temperature, moisture content, relative humidity and agricultural practices also influence the population.

The higher number of nematodes in all the seasons in sandy soil than that in the laterite soil is may be due to the well aeration due to the presence of grass roots and higher moisture content of the soil in all the seasons. The low population in the pre-monsoon and post monsoon period than that in the monsoon in both types of soil is may be due to the high temperature and low moisture content of the soil. The influence of atmospheric temperature can be correlated to the change in nematode population mostly in the surface layers where there is little difference between soil temperature and atmospheric temperature (Norton, 1978).

So the low population of the nematodes in the upper layer in premonsoon in both the soil types may be due to the high temperature and low moisture content of the soil. The higher numbers of nematodes in the upper layer in the monsoon in both soil types is may be due to the high moisture of the soil in monsoon due to rainfall.

SUMMARY

Population fluctuation and vertical distribution of the soil nematodes in sandy soil of Balasore and laterite soil of Mayurbhanj districts of Orissa was studied. Altogether seven species belonging to seven genera were identified and the relative abundance of the species in different seasons in both types of soil were analysed. In the monsoon the upper layer's population and the total population were higher in both types of soil. The Genus *Longidorous* and *Aporcelaimellus* dominated the population in sandy soil and laterite soil respectively.

ACKNOWLEDGEMENTS

The authors are deeply indebted to Dr. Ramkrishna, Director, Zoological Survey of India, Kolkata, for his keen interest in the work and providing facilities and to Sri Debabrata Sen, Zoological Assistant for helping in the taxonomic studies of the nematodes. Thanks are also due to Dr. N.C. Nandy, Scientist 'F' for going through the manuscript and offering valuable suggestions for its improvement.

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