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STUDIES ON THE SOIL NEMATODES AND CORRELATION WITH THE PHYSICOCHEMICAL PARAMETERS OF SUGARCANE FIELDS FROM PHULAMBRI TALUKA OF AURANGABAD DISTRICT (M.S) INDIA.

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ABSTRACT

Many factors are responsible to decline the productivity of agriculture field, one of the important non-visible pests is plant parasitic nematodes. This study was focused to know the soil nematodes and effect of soil parameters on the nematode diversity of sugarcane fields from Phulambri taluka Aurangabad district. The Baermann's funnel technique was applied for the extraction of soil nematodes. Seven genera of nematodes were collected & identified from soils. Which are belongs to the genus, Dorylaimus, Dorylaimoides, Hoplolaimus, Indodorylaimus, Longidorus, Eudorylaimus and Xiphinema. In this study the correlation of the diversity of the nematodes with the soil parameters is observed. After correlation between soil parameters and nematodes diversity it is observed that some soil parameters shows the positive and some shows negative effect on the diversity of nematodes. Different soil parameters viz temperature, moisture, water holding capacity, pH and electrical conductivity of the soil were also recorded during study period. In this study, Dorylaimus and Hoplolaimus acquire a highest and lowest position in population distribution in August and July month respectively. Details are discussed in the text..

Figure:00 **References:** 20 **Table:** 03
KEY WORDS: Sugarcane fields, Soil Nematodes, soil parameters, Diversity, Correlation, Phulambri taluka, Aurangabad District

Introduction

In the world India is a country which is dependent on the agriculture sector hence the India is called as agricultural country. In India most of the populations are dependent on the agriculture sector. Since from ancient time agriculture sector in India come out as traditional occupation. Now in recent day's farmer applied different types of modern and scientific technology for increasing their quality and quantity production. Indian farmer uses the different types of crop varieties and made green revolution in agriculture sector. In India the agriculture sectors, different types of crops are cultivated such as Commercial Crops (Sugarcane, Cotton and Oilseeds), Food grains (Rice, Wheat, Millets and Pulses), Plantation Crops (Tea and Coffee), horticultural crop (Strawberry, Banana, Ber and Water Melon) etc. India is the largest country in the world for sugarcane production after Brazil. The sugarcane cultivation comes under three distinct geographical regions. Such as: I) Satluj-Ganga ii) Black soil belt, and iii) Coastal region. Maharashtra is the second largest sugar producing state after Uttarpradesh in the country. Due to that only Maharashtra state contributes 34% sugar production within the country. The

sugar is the important and main element of many more diet and also important within the food and pharmaceutical industries [1]. In the country 527 sugar producing factories are in working with annually sugar producing capacity near about 242 tons. For the decline in sugarcane productivity different types of soil factors are responsible [1]. In the agriculture fields particularly for sugarcane crop the nematodes are responsible for decline in arcane productivity [2]. The diversity of the nematodes are always higher in sugarcane crop than the other crops. The 310 species and 48 genera's are reported as an endo and ectoparasitic nematodes from root and rhizosphere part of the sugarcane plant. Worldwide the plant parasitic species of nematodes such as Pratylenchus and Meloidogyne is harmful to the sugarcane crop [3]. The nematodes are the worm-like organism which are abundant and diverse in all types of soils [4].The nematodes are dependent on the moisture of soil for their movement in the soil and also required soil smaller organism for its feeding. The activities of the nematodes are controlled by physicochemical properties of the soil. The icochemical properties of the soil which are also responsible for the growth of plant [5]. Many researcher in the world demonstrated that the relationship between different soil properties and plant pathogen [[6] [7] [8] [9] [10]]. In this study we correlate the five physicochemical properties of the soil with nematodes diversity such as [Temperature, moisture, water holding capacity of the soil, pH and electrical conductivity of the soil], for the functioning and soil diversity this five soil properties plays and important role. The several researcher demonstrated that the different types of soil factors are responsible for distribution of soil nematodes [11] [12]. The main aim of this study is to provide diversity of nematodes and their correlation with the soil factors coupled with sugarcane crop in Phulambri taluka Aurangabad district (M. S.) India.

Materials and Methods

2.1. Study area

Phulambri taluka is located in the Aurangabad district Maharashtra state, having the annual rainfall 807mm and temperature variations is close to near about 6–39°c. The farming of sugarcane in Phulambri taluka Aurangabad district is characterized by the nice, sandy soils to clay loam soil. The experiment was conducted by collecting the soil samples from the various sugarcane plantation fields in Phulambri taluka of Aurangabad district in Maharashtra state. Which is located at (Latitude 20.157003 and longitude 75.507531) during May - 2016 to April - 2017. The four soil sampling sites were selected randomly from Phulambri taluka.

2.2. Soil sampling technique for nematodes

Sugarcane fields were randomly selected for soil sampling from Phulambri taluka; overall twelve soil samples were collected from four sites of Phulambri taluka. A hand auger was used for collecting soil from different location of Phulambri taluka from a depth of 0–20cm. The collected soil sample was sealed in a polythene bags and labelled it properly. The labelled soil sample were kept away from the sun and delivered to Nematology laboratory and then this soil sample sent to the MIT Institute of Technology, Aurangabad soil testing laboratory for the analysis of soil physicochemical parameters and the remaining soil sample which can use to extract nematodes in the Department of Zoology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (M.S) India.

2.3. Soil and nematode analysis

2.3.1. Soil analysis

The soils were analyzed at the MIT Institute of Technology, Aurangabad soil testing laboratory, by a scientific way [13]. The one soil parameter was analyzed on the field during soil sampling that is the temperature, and remaining four soil parameter viz moisture content, water holding

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capacity, pH, and electrical conductivity of the soil were analyzed in MIT Institute of Technology, Aurangabad soil testing laboratory.

2.3.2. Nematode extraction, identification and counting

The nematodes analyses were conducted at the Laboratory of Nematology Department of Zoology Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. Nematodes were separated from the soil by the Baermann funnel technique [14].The counting of nematodes was done under the dissecting microscope with count dish [15]. The nematodes were counted and identified up to the generic level by using identification keys of Siddiqi (2000). The abundance of nematodes was determined by no per 150gm of moist soil.

2.3.3. Statistical analyses

The collected data were analyzed by applying the correlation matrix in between nematode and soil parameters.

Results and Discussion

In the present investigation during May - 2016 to April - 2017, the monthly diversity of nematodes from Phulambri taluka and their correlation with the soil parameters is conducted. The total 661 nematodes was observed, which falls under the seven genera viz. Dorylaimus, Dorylaimoides, Hoplolaimus, Indodorylaimus, Longidorus, Eudorylaimus and Xiphinema. From this it is observed that the entire population of nematodes shows highest population in August month and lowest in July month. Details are shown in the fig.1.

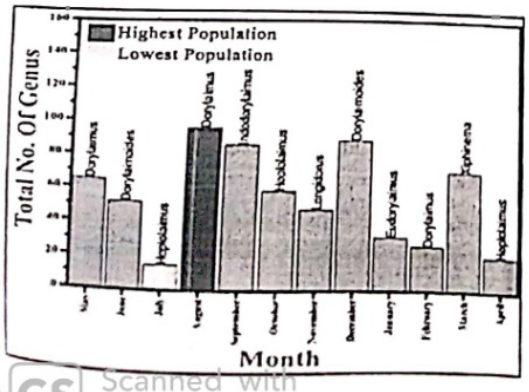

Fig.1. Population of nematodes from Phulambri taluka of Aurangabad district

Among this seven genera the Dorylaimus shows highest population in August month and Hoplolaimus shows the lowest in July month from Phulambri taluka. In this study the Indodorylaimus and Dorylaimoides shows near about equal diversity in September and December month respectively. In this study out of the 12 month, Dorylaimus are reported in May, August and February month as well as Hoplolaimus are reported in July, October and April month. From this study we are also found such genera's which are reported only in one month out of 12 month such as Indodorylaimus, Longidorus, Eudorylaimus and Xiphinema in September, November, January and March month respectively. Whereas Dorylaimoides present in the month of June and December which is shown in the Table.2. From Phulambri taluka we calculate the five soil parameters from four different sites such as Temperature, Moisture, pH, water holding capacity of the soil and electrical conductivity of the soil. In this study from Phulambri taluka we are recorded higher temperature (23°C), pH (9.73), moisture (31.46%), water holding capacity of soil (75.92%) and electrical conductivity of the soil (0.830) in March, September, November and July month respectively from Site-B, Site-C, Site-D and Site-A respectively. Details are shown in the Table.1. In this study we also studied the correlation in between nematodes diversity and soil physicochemical parameters from Phulambri taluka. Some soil parameters shows positive as well as some negative effect on the population distribution of nematodes. We correlate the genera's of the nematodes such as Dorylaimus, Dorylaimoides, Hoplolaimus, Indodorylaimus, Longidorus, Eudorylaimus and Xiphinema with the soil parameters such as Temperature, Moisture, Water holding capacity, pH, and Electrical conductivity of the soil.

Table.1. Month wise physicochemical parameters of sugarcane soil from four different sites of Phulambri taluka of Aurangabad district during May-2016-April-2017.

Month/ Year 2016-2017	Site-A					Site-B					Site-C					Site-D				
	Temp	pH	EC	MC	WHC	Temp	pH	EC	MC	WHC	Temp	pH	EC	MC	WHC	Temp	pH	EC	MC	WHC
May-16	21	7.77	0.820	18.926	36.942	22	7.56	0.512	17.646	35.946	21	7.49	0.480	20.964	23.77	20	7.01	0.627	19.3	32.906
June	20	7.24	0.810	29.06	53.494	19	7.33	0.661	24.38	55.388	20	7.04	0.721	25.08	61.99	21	7.39	0.659	28.77	56.02
July	19	7.47	0.830	28.08	52.310	20	7.32	0.590	24.10	55.115	19	7.17	0.515	24.33	59.88	20	7.02	0.647	27.58	54.210
Aug	20	7.80	0.815	27.17	53.210	19	7.28	0.630	24.90	54.809	19	7.47	0.720	23.70	60.321	20	7.08	0.670	27.65	54.710
Sep	19	7.48	0.120	28.56	68.04	19	8.37	0.175	29.04	58.02	21	9.73	0.074	31.46	64.02	20	9.63	0.192	29.43	59.08
Oct	20	7.13	0.135	28.06	57.22	19	8.68	0.090	25.78	35.02	20	8.16	0.120	28.02	52.22	20	7.83	0.134	29.58	57.34
Nove	17	8.13	0.137	24.86	38.42	21	7.34	0.112	27.16	50.84	19	8.18	0.114	28.32	81.46	18	7.59	0.159	25.08	75.92
Dec	20	8.15	0.180	25.20	41.33	19	8.37	0.130	28.21	51.23	21	7.70	0.118	28.310	65.20	20	7.80	0.170	26.33	64.56
Jane-17	20	7.07	0.140	27.10	45.03	19	7.77	0.410	27.61	52.40	19	8.10	0.125	27.40	63.21	21	7.10	0.177	25.65	62.23
Feb	19	7.40	0.385	26.20	37.20	20	7.49	0.208	25.30	50.20	19	7.48	0.397	27.40	62.10	21	8.07	0.191	26.77	60.70
March	21	8.08	0.141	25.62	26.03	23	7.67	0.194	22.96	35.28	22	7.76	0.183	27.22	49.08	22	8.94	0.170	24.84	37.04
April	20	8.09	0.155	26.30	30.21	22	7.55	0.120	23.60	26.09	21	7.30	0.125	28.29	40.55	20	8.77	0.144	25.41	36.51

...ABLE.2. Population of nematodes from Phulambri taluka of Aurangabad district during ...ay-2016-April-2017.

Name of Nematodes genuses	Months											
	May	June	July	Augu	Sent	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Dorylaimus	+	-	-	+	-	-	-	-	-	+	-	-
Dorylaimoides	-	+	-	-	-	-	-	+	-	-	-	-
Hoplolaimus	-	-	+	-	-	+	-	-	-	-	-	+
Indodorylaimus	-	-	-	-	+	-	-	-	-	-	-	-
Longidorus	-	-	-	-	-	-	+	-	-	-	-	-
Eudorylaimus	-	-	-	-	-	-	-	-	+	-	-	-
Xiphinema	-	-	-	-	-	-	-	-	-	-	+	-

Table.3. The correlation matrix among the physicochemical parameters and sugarcane soil nematodes of Phulambri taluka throughout May-2016 to Apr-2017. From Aurangabad district.

	Dorylaimus	Dorylaimoides	Hoplolaimus	Indodorylaimus	Longidorus	Eudorylaimus	Xiphinema	Temperature	Moisture	W.H.C.	pH	E.C
Dorylaimus	0.00	0.52	0.38	0.60*	0.11	0.34	-0.04	-0.26	-0.03	-0.05	0.32	-0.49
Dorylaimoides		0.00	0.83**	0.23	-0.01	0.15	0.73**	-0.83**	-0.24	-0.60*	0.22	-0.72**
Hoplolaimus			0.00	0.42	0.02	0.53	0.52	-0.79**	0.12	-0.25	0.18	-0.67*
Indodorylaimus				0.00	-0.42	0.32	-0.41	-0.16	-0.02	0.28	0.29	-0.30
Longidorus					0.00	0.40	0.13	-0.10	0.39	0.09	-0.27	0.02
Eudorylaimus						0.00	-0.10	-0.09	0.50	0.28	-0.11	-0.11
Xiphinema							0.00	-0.71**	-0.14	-0.67*	0.13	-0.55
Temperature								0.00	0.01	0.35	-0.34	0.79
Moisture									0.00	0.72	0.17	-0.14
W.H.C.										0.00	0.23	0.08
pH											0.00	-0.77
E.C												0.00

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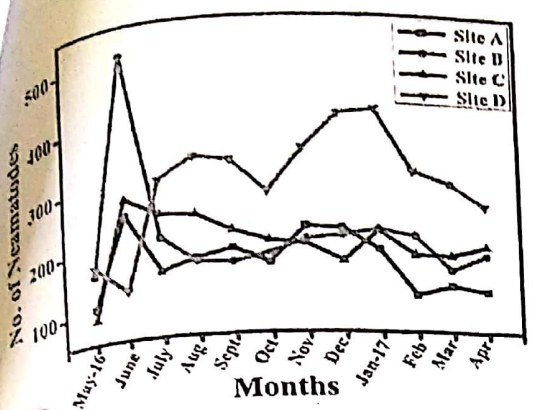

Fig.2. Abundance of nematodes from four different sites of Phulambri taluka of Aurangabad district during May-2016-April-2017.

Details are shown in Table.3. From Phulambri taluka statistically significant ($p = 0.01$) the negative correlation was observed between temperature and Dorylaimoides ($r = -0.83$), Hoplolaimus ($r = -0.79$) and Xiphinema ($r = -0.71$) means when the temperature increases the genus Dorylaimoides ultimately decreases. The water holding capacity of the soil also showed the negative effect on the genus Dorylaimoides ($r = -0.60$) and Xiphinema ($r = -0.67$) which indicating that the Water holding capacity of the soil increases, population of Dorylaimoides ultimately decreases. But the population of the nematodes from Phulambri taluka shows the non-significant association with the pH as well as the moisture content of the soil failed to show any correlation with the nematode genera's under this investigation. Finally, the electrical conductivity (E.C.) also showed the significant negative correlation with Dorylaimoides ($r = -0.72$) and Hoplolaimus ($r = -0.67$). When the electrical conductivity (E.C.) increases the population of Dorylaimoides and Hoplolaimus ultimately decreases as shown in Table.3.

Discussions

In this study we have observed some interesting facts about the diversity of nematodes from Phulambri taluka Aurangabad district. From the sugarcane soil we have identified the seven genera's of nematodes, which are belongs to genus Dorylaimus, Dorylaimoides, Hoplolaimus, Indodorylaimus, Longidorus, Eudorylaimus and Xiphinema. The total number of nematodes is 661 collected from selected fields. Out of these seven genera the genus Dorylaimus shows highest population and shows the dominancy than all collected genera. This genus shows their greater competence and cosmopolitan nature. The Similar results were also published by [16]. The Dorylaimus shows higher percentage in those sugarcane fields which has less interference of human and lower percentage shows that the higher interference of human [17]. In this study we also find out the relationships between diversity of soil nematodes and soil parameters. The soil parameters are the indicator of soil health and its functions and it also influence to the nematodes diversity [18]. To understand the relationships between nematodes genera's and soil physicochemical parameters we applied the different types of statistical analyses. [19] [20]. In this study, we have identified the seven genera of the nematodes and understood their correlation with the soil parameters from Phulambri taluka. We correlate the nematode genera with the soil parameters such as temperature, moisture content of soil, water holding capacity of the soil, pH and electrical conductivity of the soil from Phulambri taluka. From this some parameters positively as well as negatively correlated with nematodes diversity. The moisture content of the soil doesn't show any effect on the diversity of the nematodes, from Phulambri taluka. On the nematodes diversity the water holding capacity of the soil showed the negative correlation with the some genera's of the nematodes. The temperature, showed the negative correlation with the diversity

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of nematodes as well as electrical conductivity showed significantly negative correlation with nematodes diversity, but pH doesn't show any effect on the nematodes diversity from Phulambri taluka.

Conclusion

At the end of the study it is concluded that the, diversity of the nematodes is very high in the sugarcane fields of Phulambri taluka. The dominating population of soil nematode was from Phulambri Dorylaimus is high This diversity of the nematodes was influenced by the soil paramcters such as water holding capacity of the soil, moisture content, pH, electrical conductivity of the soil and temperature. Among this five parameters the water holding capacity of the soil, temperature of the soil, and electrical conductivity of the soil shows the negative correlation with nematodes diversity but the pH and moisture content of the soil failed to show the any effect on the nematodes diversity from Phulambri taluka.

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