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ISOLATION AND IDENTIFICATION OF SOIL FUNGI IN SILTARA INDUSTRIAL AREA PHASE –II, RAIPUR CHHATTISGARH IN WINTER SEASON

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Abstract: **Soil is home of many micro-organisms including fungi. The type of fungal flora present in the soil depends on composition of soil. Human interference, industrialization, cultivation etc. has adverse effect on soil environment and thus influences soil microflora. The present paper deals with isolation and identification of soil fungi in Siltara industrial area phase – II, Raipur Chhattisgarh in winter season. The fungal population were isolated and identified as - *Aspergillus terreus, Penicillium chrysogenum, Phialophora cinerescens, Penicillium expansum, Acrophialophora fusispora, Fusarium pallidoroseum, Penicillium sclerotiorum, Aspergillus niger, Alternaria alternata*, and *Aspergillus versicolor.* The highest percentage frequency of *Aspergillus terreus* (100%) and highest percentage contribution (27.54%) of *Aspergillus terreus* was observed.**

Keywords: **Soil fungi, Siltara, Industrial area, winter season.**

I. INTRODUCTION

Soil is a complex ecosystem; it differs in physio chemical properties [12].The diversity of soil microorganisms is more extensive than in any other environment. Large number of genera and species of fungi occur in soil as compared to other environment [5]. pH of soil, organic matter and water are the main factors that affects the population of fungi and its diversity in soil. The proportion of saprophytic fungi is the largest in soil. They help in decomposition of cellulose, hemicellulose and lignin and help in maintenance of carbon cycle [14].

Microbial population is crucial to sustain soil ecosystem, especially fungi and bacteria as they help in nutrients cycling [9].Only a fraction of total fungal wealth is explored. One third of fungal diversity exists in India. Out of 1.5 million of fungi only 50% are characterized [6].

In Siltara industrial area Iron and steel industries are prevalent and so the processing of metal takes place here. The soil of the area has deposition of scoria that increases the possibility of leaching of heavy metals used in processing of iron and steel in soil. The vegetation here is scanty. The present paper investigates the percentage frequency and percentage contribution of soil fungi in Siltara industrial area phase –II, Raipur Chhattisgarh in winter season.

II. MATERIAL AND METHODS

A. Study area

The present study is carried out in industrial area of Raipur with special reference to Siltara industrial area Phase-II, Raipur Chhattisgarh. Siltara is the major industrial area located 13 Km away from Raipur. For isolation of fungi the industrial area is divided into 5 sample areas nearly 5 to 7 Km. apart. Soil is collected at depth of 10cm once in a month in sterilized conditions in sterile polythene bags and brought to laboratory for isolation. The samples were collected in winter season ie, from November 2016 to February 2017.The average temperature at the time of isolation in the month of November was 24 ^{0} C and the relative humidity was 69%, in the month of December the temperature was 22.5^0 C and the relative humidity 54%, in January the temperature was 22.5^0 C and the relative humidity 58% and in the month of February the temperature and relative humidity were 27.5^{0}C and 43% respectively. Raipur, the capital of Chhattisgarh is located at 21.233330N latitude and 81.633330E longitude. Raipur is amongst the 20 most polluted cities in the world and the third worst polluted city of India, according to a World Health Organization report on pollution. The prime cause of pollution is heavy industrialization in and around Raipur city.

B. Isolation of fungi

Fungi are isolated from collected soil samples by serial dilution method, dilutions 10^{-4}, 10^{-5} and 10^{-6} were used for isolation of fungi. Small aliquots from each dilution were transferred in pre-poured PDA petriplates triplicate of each dilution supplemented with streptomycin to check the growth of bacteria. The petriplates were then incubated for 2 to 5 days at 26+-1^{0}C for proper growth in incubator [11].

C. Identification of fungi

Fungal morphology was studied macroscopically by observing different colony features and colony characteristics. Microscopic study was done by lactophenol cotton blue mounting and observed under compound microscope for conidia, conidiophores and arrangement of spores [1].

Identification of isolated fungi was done by microscopic observation and through available literature [5], [2]. Further cultures were also sent to NFCCI Pune for identification.

D. Ecological studies

For Biodiversity analysis of fungi, Ecological studies were done. For Ecological studies percentage frequency and percentage contribution of the fungal flora were calculated with the help of following formula- [10].

$$\text{Percentage frequency} = \frac{\text{Number of observations in which a species appeared}}{\text{Total number of observation}} \times 100$$

$$\text{Percentage contribution} = \frac{\text{Total number of colonies of a species in all the observations taken together}}{\text{Total number of colonies of all species}} \times 100$$

Interrelationship between microorganisms with their living and non living environments is studied through mycobial ecology. In the present study percentage frequency and percentage contribution of soil mycoflora were observed during November 2016 to Feb 2017 in winter season. It was observed that maximum frequency is of *Aspergillus terreus*(100%) and minimum frequency is of *Aspergillus versicolor*(25%) and *Alternaria alternata*(25%).Where as highest percentage contribution is shown by *Aspergillus terreus*(27.54%) and lowest by *Aspergillus versicolor*(1.45%) and *Alternaria* (1.45%).Table-I

TABLE-I: SHOWING PERCENTAGE FREQUENCY AND PERCENTAGE CONTRIBUTION OF FUNGAL SPECIES IN WINTER SEASON

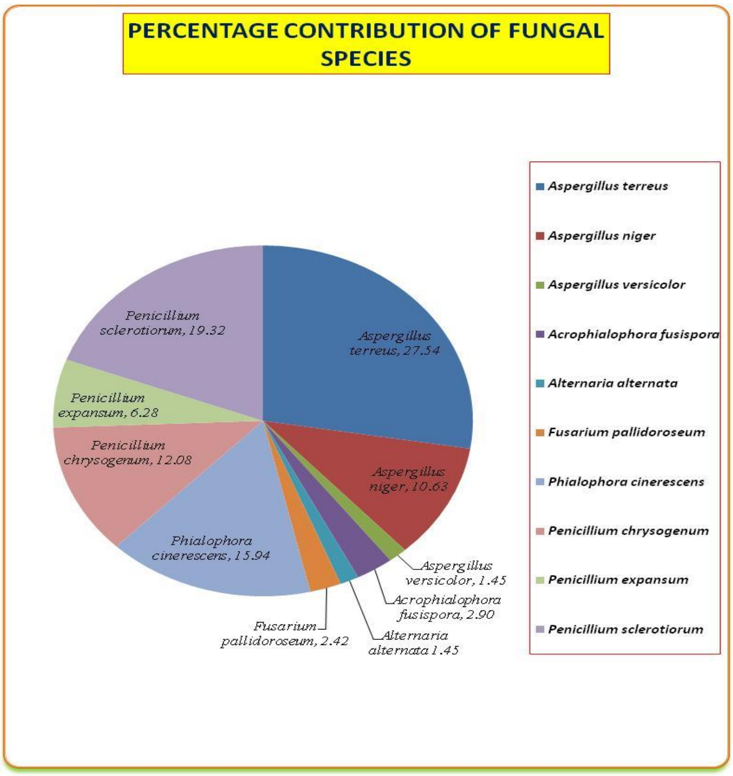
S. No.	Name of the fungal species	Nov	Dec	Jan	Feb	Total no. of colones of species	Percentage frequency	Percentage contribution
1	*Acrophialophora fusispora*	-	3	3	-	06	50%	02.90%
2	*Alternaria alternata*	-	-	-	3	03	25%	01.45%
3	*Aspergillus niger*	4	-	-	18	22	50%	10.63%
4	*Aspergillus terreus*	6	16	22	13	57	100%	27.54%
5	*Aspergillus versicolor*	3	-	-	-	03	25%	01.45%
6	*Fusarium pallidoroseum*	2	3	-	-	05	50%	02.42%
7	*Penicillium chrysogenum*	3	17	5	-	25	75%	12.08%

8	*Penicillium expansum*	-	5	-	8	13	50%	06.28%
9	*Penicillium sclerotiorum*	-	-	17	23	40	50%	19.32%
10	*Phialophora cinerescens*	-	6	11	16	33	75%	15.94%
	TOTAL	**18**	**50**	**58**	**81**	**207**		

TABLE-II SHOWING MONTH WISE PERCENTAGE CONTRIBUTION OF FUNGAL SPECIES IN WINTER SEASON

s.no	Name of fungal sp.	Nov	Dec	Jan	Feb
1	*Acrophialophora fusispora*	-	06.0	5.17	-
2	*Alternaria alternata*	-	-	-	03.7
3	*Aspergillus niger*	22.2	-	-	22.2
4	*Aspergillus terreus*	33.3	32.0	37.9	16.0
5	*Aspergillus versicolor*	16.6	-	-	-
6	*Fusarium pallidoroseum*	11.1	06.0	-	-
7	*Penicillium chrysogenum*	16.6	34.0	08.6	-
8	*Penicillium expansum*	-	10.0	-	09.8
9	*Penicillium sclerotiorum*	-	-	29.3	28.3
10	*Phialophora cinerescens*	-	12.0	18.9	19.7

GRAPH-I



GRAPH SHOWING GROUP WISE PERCENTAGE CONTRIBUTION OF FUNGAL SPECIES OF SOIL MYCOFLORA IN WINTER SEASON

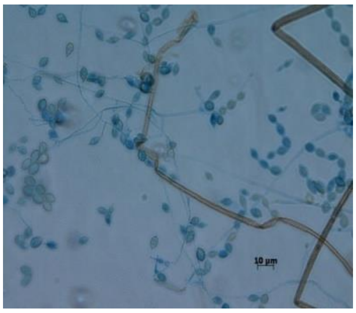


Fig.1 ***Acrophialophora fusispora***

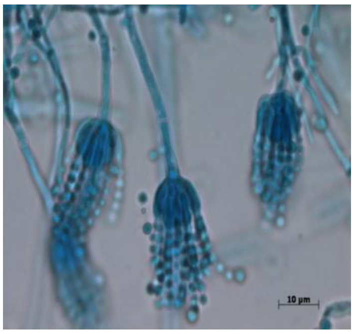


Fig.2 ***Penicillium sclerotiorum***

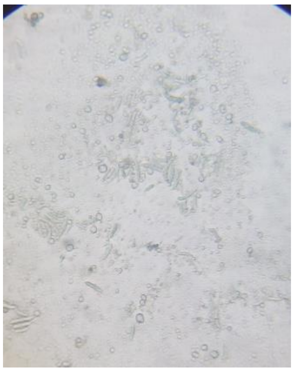


Fig.3 ***Fusarium pallidoroseum***

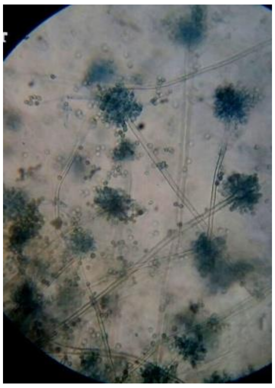


Fig. 4 ***Aspergillus versicolor***

Fig5. ***Aspergillus terreus***

Fig. 6 ***Aspergillus niger***

Fig. 7 ***Penicillium chrysogenum***

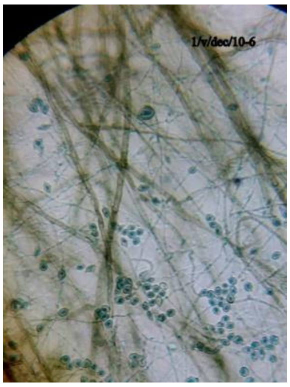
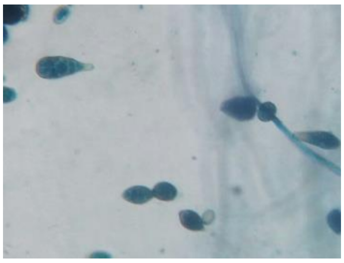


Fig. 8 ***Phialophora cinerescens***



Fig, 9 ***Alternaria alternata***

III. RESULTS AND DISCUSSION

Seasonal variation plays an important role in distribution of fungal species of a particular area. Fungal species are affected by weather conditions like temperature relative humidity and rainfall. Weather of Raipur is categorized by three seasons rainy, winter and summer seasons. The present study investigates the biodiversity of soil fungi in the winter season (November 2016 to February 2017).

During present investigation 10 fungal species (207 colonies) belonging to anamorphic fungi were observed.

A. Ecological studies

To study the interrelationship between the microorganism and their living and non-living environment percentage frequency and percentage contribution were observed. Maximum percentage frequency observed for *Aspergillus terreus* (100%) followed by *Penicillium chrysogenum* (75%), *Phialophora cinerescens* (75%), *Penicillium expansum* (50%), *Acrophialophora fusispora* (50%), *Fusarium pallidoroseum* (50%), *Penicillium sclerotiorum* (50%), *Aspergillus niger* (50%), *Alternaria alternata* (25%) and *Aspergillus versicolor* (25%).

In the present study *Aspergillus terreus (*27.54%) contributes maximum in fungal diversity followed by *Penicillium sclerotiorum* (19.32%), *Phialophora cinerescens* (15.94%), *Penicillium chrysogenum* (12.08%), *Aspergillus niger* (10.63%), *Penicillium expansum* (6.28%), *Acrophialophora fusispora* (2.90%), *Fusarium pallidoroseum* (2.42%), *Alternaria alternata* (1.45%) and *Aspergillus versicolor* (1.45%).

Month wise fungal species were also observed during present investigation. In the month of November maximum percentage contribution is observed for *Aspergillus terreus* (33.3%), *Penicillium chrysogenum*(34%) contributed maximum in December while *Aspergillus terreus* (37.9%) and *Penicillium sclerotiorum* (28.3%) had shown maximum percentage contribution in January and February respectively.

The maximum percentage contribution of *Aspergillus terreus* was also observed by [15] in their studies on paddy crop fields of Mysore. These results are also in agreement with the results of [16] as they also found *Aspergillus* and *Penicillium* species dominant in their studies on crop fields, [8] found *Aspergillus terreus* dominant in their investigation of microflora of potted soil. Dominance of *Aspergillus* and *Penicillium* genera in petro polluted soil by [3] is also in agreement with the present study. *Aspergillus terreus* was found as the dominant (25.5%) one in paddy field soil by [13] agrees with the dominance of *Aspergillus terreus* in the present investigation.

Aspergillus terreus is used for bioremediation for degradation of diesel and endosulfan [7]. The maximum percentage contribution and percentage frequency are of *Aspergillus terreus* explores the possibility of this fungus for biodegradation of industrial waste.

IV. CONCLUSION

The ecological studies of of soil mycoflora in siltara industrial area, Raipur Chhattisgarh in winter season provide us data of diversity of fungi of this area. The data is helpful in finding out harmful and beneficial fungi in soil. Beneficial fungi are useful for nutrient cycling and degradation of harmful substances further it reflects the quality of soil and soil health. This data can also be used for bioremediation and bio augmentation. Soil bioremediation can help to degrade various contaminants and convert them into harmless compounds using natural biological activity of some fungi. Bio augmentation and bio stimulation are two important approaches of bioremediation [4].

V. SCOPE FOR FUTURE WORK

It explores the possibility to study these fungi for heavy metal absorption and bioremediation at low cost and in eco friendly way**.**

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