DOI : 10.33451/florafauna.v25i1pp69-72

FLORA AND FAUNA ISSN 2456 - 9364 (Online)

2019 Vol. 25 No. 1 PP 69-72 ISSN 0971 - 6920 (Print)

Distribution of vesicular-arbuscular mycorrhizal fungi in soils polluted with industrial and sewage effluents

***N.K. Srivastava, Jayraj Pandey and Indu Singh**

Department of Zoology,
K.N.I.P.S.S., SULTANPUR (U.P.)
*Department of Botany,
S.D.J. (P.G.) College,
Chandeshwar, AZAMGARH
*Corresponding Author :
Email : naveensrivastava15@yahoo.com

Received **:** 28.03.2019; ***Accepted*** : 17.05.2019

ABSTRACT

The microbial communities including VAM fungi get affected by the sewage and industrial effluent. About this there is not much information. Soil polluted with sewage effluents supported less VAM population than non-polluted. 44 VAM fungal species were collected and indentified.

Figure : 00 References : 06 Tables : 03

KEY WORDS : Effluents, Industrial, Pollution, Sewage, Soil, VAM fungi.

Introduction

Indiscriminate use of pesticides, fertilizers and other pollutants cause undesirable changes in the soil ecosystem thus disturbing its physico-chemical set up and biological spectrum. Sewage effluents are a rich source of organic wastes, while industrial effluents contain many chemicals, including many heavy metals. The microbial communities, including vesicular-arbuscular mycorrhizal (VAM) fungi, may get affected by the sewage and industrial effluents. About this there is not much information. Hence, this study has been taken up.

Materials and Methods

In the present study, the soil which was distant from the effluent site and supported many weeds, grasses and other plant communities was considered as control. The soil site which received industrial effluents rich in caustic soda, acetic acid, soap, sodium silicate, ammonium sulphate, print colour and other effluents has been considered as the second sampling site. The third sampling soil site received only sewage effluents and supported only on type of grass. The soils were analysed for VAM fungi quantitatively following the wet sieving and decanting technique[1]. The soils were analysed for soil type, pH, soil temperature, moisture, chlorides, available nitrogen, available phosphorus, available potassium, organic carbon, ferric, manganese, zinc, copper, cobalt, nickel, lead and cadmium following standard

TABLE-1 : Number of VAM fungal propogules in 100 g of three sampling sites

Months /Year 2015-2016	S_1	S_2	S_3
June 2015	740	300	116
July	664	328	180
August	632	500	204
September	328	320	208
October	532	312	172
November	572	192	168
December	352	220	132
January 2016	250	129	44
February	460	128	64
March	580	480	80
April	784	440	96
May	642	472	108

[a] = absent; [b] = present;

Notes- S_1 non-polluted soil, S_2 polluted soil with industrial effluents; S_3 polluted soil with sewage.

ACKNOWLEDGEMENT : Authors are thankful to Principal S.D.J. (P.G.) College, Chandeshwar, Azamgarh (U.P.) for providing facilities and encouragements.

methods[2-6].

Results and Conclusion

Soil polluted with the sewage effluent supported less VAM population than non-polluted soils. Altogether, 44 VAM fungal species were collected and indentified. The non-polluted soil contained 15 VAM species, whereas the soil polluted with industrial effluents harboured 26; only 9 species were found associated with the soil receiving sewage effluents. *Gigaspora* and *Scute*llospora,

TABLE-2 : Distribution of VAM species in non-polluted and polluted soils

VAM Species	S_1	S_2	S_3
Acaulospora appendicula	-[a]	-	+[b]
A. delicata	-	+	-
A. denticulata	+	-	-
A. foveata	-	-	+
A. lacunosa	+	-	+
A. laevis	-	+	-
A. mellea	+	-	+
A. nicoisonii	-	+	-
A. spinosa	-	+	+
A. tuberculata	-	+	-
Gigaspora albida	+	-	-
G. decipiensps	+	-	-
G. gigantea	+	-	-
G. margarita	+	-	-
Glomus aggregatum	-	+	-
G. botryoides	-	+	-
G. citricolum	-	-	+
G. claroideum	-	+	-
G. delhiense	-	+	-
G. dimorphicum	-	+	-
G. fascicalatum	-	+	-
G. fecundisporum	-	+	-
G. flavisporum	-	+	-
G. geosporum	-	+	-
G. hoi	-	-	+
G. intraradices	-	+	-
G. leptotichum	-	+	-
G. macrocarpum	-	+	-
G. maculosum	-	+	-
G. manihotis	-	+	-
G. mosseae	-	+	+
G. pustulatum	-	+	-
G. reticulutum	-	+	-
G. tortuosum	-	-	+
G. versiforme	-	+	-
Sclerocystis clavispora	+	-	-
S. coccogena	-	+	-
S. pakistanica	+	+	-
S. sinuosa	+	+	-
Scutellospora albarosea	+	-	-
S. calospora	+	-	-
S. gregaria	+	-	-
S. nigra	+	-	-
S. reticulata	+	-	-

S_1 - Sandy loam , S_2 - Sandy Siltloam, S_3 - Sandy clay loam

which were found in non-polluted soils were absent in the soil polluted with industrial and sewage effluents. *Glomus* was completely absent in the non-polluted soil. The soils below neutral pH favoured more VAM fungal population while those with the pH range 7.02 to 8.1 had supported more VAM fungal species. Soil moisture was inversely related to VAM fungi. Chlorides, bicarbonates and nitrogen did not affect VAN fungal dynamics. The soils with moderate to less phosphorus content supported more VAM fungal population. Soils with less potassium, 1-3% organic carbon, 53 to 330 ppm of iron and 4.5 to 17.5 ppm of manganese favoured more VAM fungi. Nickel and lead were found toxic at higher levels. The soil type therefore affects the VAM fungi dynamics.

TABLE-3 : Physico-chemical factors and statistical data

Factors	S_1 (Sandy loam)			S_2 (Sandy silt loam)			S_3 (Sandy clay loam)		
	1	2	3	1	2	3	1	2	3
pH	6.06	0.32005	1.06830	7.3	0.20362	0.65770	7.2	0.06088	0.19289
Moisture (%)	5.53	0.13123	0.41862	14.725	0.10022	0.31853	11.08	0.1722	0.55283
Temperature	37^0C	0.32505	1.08692	31^0C	0.24940	0.81442	29.7^0C	0.31252	1.04039
Bicarbonates	26.440	0.01534	0.04853	37.118	0.50049	1.82817	34.659	0.04123	0.13050
Chloride	11.700	0.50629	1.85656	114.74	0.36839	1.25311	22.072	0.17253	0.55390
Nitrogen (ppm)	70.58	0.03724	0.11786	124.32	0.10984	0.34947	247.21	0.45744	1.62674
Phosphorus (ppm)	29.52	0.40025	1.38117	32.9	0.23642	0.76944	125.2	0.038612	1.32370
Potassium (ppm)	107.8	0.37492	1.27891	125.3	0.182592	0.58729	200.5	0.18701	0.60201
Organic Carbon (%)	1.24	0.14364	0.45899	3.40	0.28379	0.93591	4.05	0.20566	0.66456
Iron (ppm)	108	0.19574	0.63121	163.1	0.19141	0.61672	218	0.70235	3.12020
Manganese (ppm)	9.63	0.51733	1.91166	6.70	0.20671	0.66811	16.7	0.34014	1.14385
Zinc (ppm)	2.023	0.22436	0.72808	6.37	0.14652	0.46840	2.99	0.05679	0.17990
Copper (ppm)	1.216	0.16028	0.51351	3.54	0.15952	0.51100	4.08	0.34572	1.16512
Cobalt (ppm)	8.091	0.02593	0.08204	10.17	0.32022	1.06892	12.67	0.4288	1.50101
Nickel (ppm)	0.629	0.48404	1.74928	30.39	0.10857	0.34537	2.132	0.3398.3	1.14266
Lead (ppm)	3.25	0.07940	0.25191	2.945	0.55385	2.10354	2.744	0.55385	2.10354
Cadmium (ppm)	0.103	0.15963	0.51135	0.119	0.28646	0.94552	0.153	0.50441	1.84734

References

1. Gerdemann JW, Nicolson TH. Spores of mycorrhizal *Endogone* species extracted from soil by wet sieving and decanting. *Transactions of the British Mycological Society.* 1963; **46**: 235-246.

2. Hanway, Heidal. Soil analysis : Methods used in Iowa State College soil testing laboratory. *Lowa Agronomy*. 1952; **57**: 1-31.

3. Issac RA, Kerber JD. Atomic absorption and flame photometry techniques and uses in soil, plant and water analysis. In Instrumental Methods for Analysis of Soil and Plant Tissue. Walsh (ed.) Madison, Wisconsin : Soil Science Society of America Inc. Madison. 1971; 17-37.

4. Olsen SR, Cole CE, Watanabe FS, Dean LA. Estimation of available phosphorus in soil by extract with sodium bicarbonate. *US Department of Agriculture Circular.* 1954; **939** : 1-9.

5. Piper CS. Soil and plant analysis. Adelaide : University of Adelaide.1944.

6. Subhaiah BV, Asija GL. A rapid procedure for determination of available nitrogen in soils. *Current Science.* 1956; **25** : 259-260.