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Microbial diversity & their properties in semi arid barren soils of North Gujarat

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ABSTRACT

Semi-arid barren soils of North Gujarat region, clayey loam in nature, were collected and analyzed for their physical, chemical properties and also for microbial diversity. Results showed great variety in soil microbial diversity with physiochemical properties. The bacterial flora is described by total count & total Biomass (C & N) distribution in different soil layer. Total number of microorganisms is not related to geographic or internal soil patterns but to content of organic matter (C & N). Distributions of bacterial community shows individual patterns of soil profiles and are not related to overall geographic patterns.

KEYWORDS

Barren soils;
Microbial diversity;
Biomass;
Organic matter.

INTRODUCTION

Soil is a very complex system comprises a variety of microorganisms with different physicochemical gradients and discontinuous environmental condition. Microorganisms adapt environment and live together in consortia with more or less sharp boundaries, interacting with each other and with other parts of soil biota[6]. Analysis of the spatial distribution of bacteria at ecosystem level showed that in soils subjected to different fertilization treatments[3]. Particle size had a higher impact on microbial diversity and community structure than did factors like WHC, FC, C/N, pH and the type and amount of organic compound input including Carbon and Nitrogen[2]. Soil sequences are described with respect to the changing rhizosphere regime and special attention is given to the microbial communities with diversity indices values in these soils[1]. This study presents soil data from several locations along with microbial diversity indices and physicochemical properties. Correlate indices values with properties for linearity.

MATERIALS AND METHODS

Soil were sampled from different Barren soils of North Gujarat.Soils were described by soil texture, humidity, and definition of levels at various locations. Physical properties studied for Texture, % Moistue, %Water Holding Capacity (WHC), %Field Capacity (FC) and pH for all soil samples. Chemical properties studied for determinations of Chloride (gm %), NO_2 –

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TABLE 1 : Physical properties of soil samples

Sample No.	Depth (cm)	Texture	pH	% Moisture	%WHC	%FC
1A	0-10	Clay	7.6	11.42	3.12	6.25
1B	20-30	Clay	7.6	14.58	10	13.33
2A	0-10	Clay	7.6	7.58	10.71	14.28
2B	20-30	Clay	7.9	17.23	8	12
3A	0-10	Clay	8.1	1.78	4	12
3B	20-30	Clay	8.1	0.67	3.57	7.14
4A	0-10	Clay loam	7.6	36.51	6.25	12.5
4B	20-30	Clay loam	7.6	37.31	7.14	7.14
5A	0-10	Silty clay	7.8	34.58	7.14	7.14
5B	20-30	Silty clay	7.8	45.56	5.26	5.26
6A	0-10	Clay	7.6	2.75	5.26	26.31

TABLE 2 : Chemical properties of soil samples

Sample No.	Cl (gm%)	NO_2-N_2	%Org.C	%Total N	% BM C	% BM N
1A	0.011	0.0513	1.424	0.00246	0.807	0.00634
1B	0.012	0.0461	1.39	0.00798	1.003	0.00737
2A	0.013	0.0474	1.845	0.00159	0.198	0.00796
2B	0.012	0.0409	1.867	0.00271	0.245	0.0037
3A	0.014	0.0475	1.818	0.0028	0.11	0.00888
3B	0.012	0.0214	1.702	0.00344	0.258	0.00038
4A	0.005	0.0208	1.778	0.00346	0.137	0.00193
4B	0.006	0.107	1.793	0.00229	0.052	0.0079
5A	0.0021	0.0247	1.808	0.00226	0.871	0.0062
5B	0.03	0.0312	1.84	0.00237	2.085	0.00031
6A	0.0177	0.0299	0.61	0.00142	0.976	0.00124

TABLE 3 : Total microbial count of soil samples (10^7 cfu/gm)

Sample No.	Bacteria	Actinomycetes	Fungi	Diazotrophs
1A	3.62	2.07	0.00	0.008
1B	0.85	2.25	0.00	0.0082
2A	3.80	2.07	0.00	0.009
2B	3.10	2.07	0.00	0.0078
3A	2.36	0.90	0.00	0.0016
3B	1.89	3.33	0.00	0.009
4A	3.60	1.62	0.00	0.0065
4B	1.80	2.07	0.00	0.0067
5A	0.87	3.60	0.00	0.0135
5B	1.68	2.07	0.00	0.01
6A	1.35	0.90	0.90	0.54

TABLE 4 : Bacterial diversity indices of soil samples

Sample No.	S.W.I.	α-Diversity	β-Diversity	Richness	Evenness
1A	2.1199	1.4849	3.1480	3.2227	1.5292
1B	3.5830	2.0424	7.3181	2.3847	3.2614
2A	2.0707	1.4940	3.0938	1.2510	2.9875
2B	2.2742	1.6677	3.7929	1.1162	3.2812
3A	2.5433	1.0868	2.7641	1.8354	2.3150
3B	2.7583	2.0061	5.5335	2.4290	1.9898
4A	2.1032	2.7164	5.7133	2.2293	1.9144
4B	2.8075	1.5343	4.3077	2.3452	2.0253
5A	3.5468	2.9062	10.308	1.2817	5.1172
5B	2.8771	1.5554	4.4752	2.0722	2.0755
6A	2.9026	1.4240	4.1334	0.0330	2.6420

TABLE 5 : Actinomycetes diversity indices of soil samples

Sample No.	S.W.I.	α-Diversity	β-Diversity	Richness	Evenness
1A	2.5651	2.1462	5.5053	0.6255	3.7009
1B	2.4827	1.1133	2.7642	5.7669	4.8310
2A	2.5651	2.2142	5.6797	0.0374	2.5651
2B	2.5651	2.2341	5.7308	0.0374	2.5651
3A	3.3915	2.1374	7.2492	2.0509	3.0871
3B	2.0945	1.4994	3.1406	0.1687	2.0945
4A	2.8080	4.5969	12.9083	0.9271	2.5559
4B	2.5651	0.4886	1.2534	1.6255	3.7009
5A	2.0171	1.2348	2.4908	1.2193	2.9890
5B	2.5651	1.4158	3.6318	0.6255	3.7009
6A	3.4260	1.8098	6.2004	0.8947	3.4260

TABLE 6 : Fungal diversity indices of soil samples

Sample No.	S.W.I.	α-Diversity	β-Diversity	Richness	Evenness
1A	0	0	0	0	0
1B	0	0	0	0	0
2A	0	0	0	0	0
2B	0	0	0	0	0
3A	0	0	0	0	0
3B	0	0	0	0	0
4A	0	0	0	0	0
4B	0	0	0	0	0
5A	0	0	0	0	0
5B	0	0	0	0	0
6A	3.0009	2.0660	6.2000	0.1407	3.0009

N_2 (mg%), %Oraganic C, % Total N, Biomass C and Biomass N for all soil samples (Misra, R. 1968). Microbial analysis included Total Bacterial Number (TBN), Actinomycetes, Fungi & Diazotrophs were counted by SPC by using respective Hi-media chemicals. For calculating Diversity indices including S.W.I.,

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TABLE 7 : Diazotrophic diversity indices of soil samples

Sample No.	S.W.I.	α-Diversity	β-Diversity	Richness	Evenness
1A	4.2595	0.00060	0.00014	2.1402	6.1455
1B	3.2670	0.00170	0.00052	1.1407	3.2670
2A	4.2580	0.00055	0.00013	2.1425	6.1434
2B	4.2567	0.00064	0.00015	2.1397	6.1415
3A	4.2488	0.00013	0.00003	4.1144	3.0650
3B	4.2580	0.00047	0.00011	1.1425	4.2580
4A	4.2553	0.00132	0.00031	2.1362	6.1395
4B	4.2553	0.00047	0.00011	2.1368	6.1395
5A	4.2645	0.00281	0.00066	2.1513	6.1527
5B	4.258	0.00000	8.3532	2.1425	6.1434
6A	3.5814	3.70066	1.0333	1.3839	2.8383

α-Diversity, β-Diversit, richness & evenness.

RESULTS AND DISCUSSION

Physical properties of the soils were varies in most of the soils layers because of humification, some even to deep layers. Some sites possessed lower biomass ratio may be perhaps the reason for higher microbial population. The composition and structure of the vegetation at each site was somewhat different. The rhizosphere effect more on Bacteria, Fungi, Actinomycetes and Diazotrophs and also the microorganisms remain most active compare to non-rhizosphere region. It was observed that Rhizosphere was more dominated by gram-positive rods. In contrast, non-rhizosphere soil was dominated by gram-positive cocci. Population of Actinomycetes was remarkably high in non-rhizosphere soil compared to Rhizosphere.

CONCLUSION

Microbial diversity has a positive effect on nutritional cycling efficiency and contributes to increased ecosystem process. One major effect that microbial diversity has ecosystem processes is to ensure that all organic compounds recycled. Organic compound diversity may have a negative or neutral effect on a stable ecosystem. The relationship between microbial diversity and soil processes may not be linear because a consortium of microorganisms carries out many processes. In interacting consortia, small linear changes in microbial diversity may result in non-linear changes in process.

REFERENCES

[1] M.Bolter; Proc.NIPR Symp.Polar.Biol., **9**, 283-298 **(1996)**.

[2] M.Bolter, M.Moller, W.Dzomla; Micron, **24**, 31-40 **(1993)**.

[3] M.Bolter, E.M.Pfeiffer; CRREL.Spec.Rep., **97(10)**, 481-487 **(1997)**.

[4] R.Misra; 'Ecological Work Book', (R.Misra, Ed.), Oxford & IBH Publ. Co. New Delhi, **(1968)**.

[5] V.Torsvik, L.Ovreas; Current Opinion in Microbiology, **5**, 240-245 **(2002)**.

[6] Trivedi Ratna; 'Microbial Diversity & Enzyme Activity of Semi Arid Soil', M.Sc. Thesis, S.M.University, Gangtok, 52-53 **(2003)**.