

MICROBIOLOGICAL STUDIES OF FOREST SOILS IN EASTERN NEPAL

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Microbiological analysis presented in this report are carried out in the laboratory of Division of Soil Science and Agricultural Chemistry, Department of Agriculture, HMG of Nepal, according to the standard procedure of POCHON and TARDIEUX (Techniques d'analyse en microbiologie du sol. - Editions de La Tourelle, St-Mandé, France, 1962).

The authors express their sincere thanks to Mr. M. L. PRADHAN, Chief of the Division who kindly provided them all the necessary facilities for this work.

Soils were collected by Dr. J. F. DOBREMEZ in september 1972 in eastern Nepal along the ridge from Dharan to Topke Gola.

Taxonomy of Microfungi of these soils was worked out by G. FRANZ, Institut für Bodenkunde der Universität, Bonn (Beitrag zur Verbreitung der Mikroskopischen Bodenpilze in Nepal, Nova Hedwigia, 1975, XXVI, 105-123).

Taxonomy of Bacteria of soils samples n° 11, 12, was worked out by A. MONTCOUYOUX, Université de Saint-Etienne, France, U. E. R. des Sciences (1975, Thèse de 3ème Cycle, Microbiologie).

Table I - Ecological data of soil samples

Soil N°	Altitude (m)	Place	Date	Vegetation	Vegetation level
1	4 450	Above Topke Gola	26. 08. 72	Saussurea gossypiphora Rheum nobile	upper alpine
2	4 300	Rato Ural	28. 08. 72	Rhododendron anthopogon	lower alpine
3	4 300	Rato Ural	28. 08. 72	Kobresia	lower alpine
4	3 800	Gopte Ural	29. 08. 72	Rhododendron campanulatum (slope 45°)	upper subalpine
5	3 700	Gopte Ural	29. 08. 72	- idem - (slope 0°)	upper subalpine
6	3 600	Gopte Ural	29. 08. 72	Rhododendron campylocarpum	upper subalpine
7	3 500	Gopte Ural	29. 08. 72	Rhododendron hodgsoni	upper subalpine
8	3 600	Guide Himal	30. 08. 72	Mixed Rhododendron Forest (Podzol)	upper subalpine
9	3 600	Hile	30. 08. 72	Carex (hydromorphic soil)	upper subalpine
10	2 900	Lam Pokhari	31. 08. 72	Pond	montane
11	2 900	Lam Pokhari	31. 08. 72	Rhododendron arboreum	montane
12	2 700	Phedi	01. 09. 72	Lyonia ovalifolia	montane
13	3 000	above Phedi	01. 09. 72	Rhododendron barbatum	lower subalpine

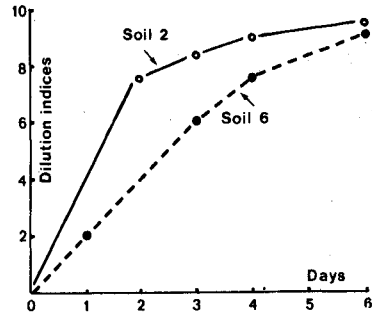
Total Microflora

Data presented in Table 1 shows that the number of total bacteria in these soils varies from 2.3 to 3500 millions indicating that the soils are quite rich in microbial flora. As much as 3300 and 3500 millions of bacteria are evaluated in Soil N° 4 and Soil N° 1, respectively but in case 2.3, 2.9 and 3.0 millions, respectively.

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Ammonification

Ammonification is quite active in these soils. In most of the soils, biological activity is enhanced within 2 to 3 days (Graph 1). According to Table 1, the number of ammonifying bacteria presented in these forest soils varies from 450 to 14 000 millions. The population of ammonifying bacteria are maximum in majority of soils. Soil N° 6 contains the least number of bacteria. In this soil, biological activity of ammonifying bacteria is very slow as compared to other soils (Graph 1).

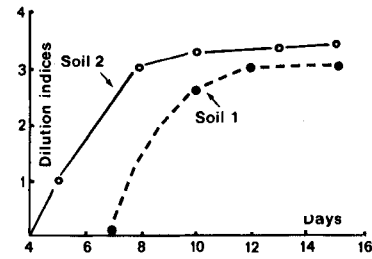


Graph 1 - Ammonification activity

Nitrification

The number of Nitrobacter in Soil n° 1, 3 and 9 are 1600, 600 and 250 thousands respectively but in case of Soil N° 5 and 10 they are present in few number. On the other hand, Soil N° 7 and 8 do not contain at all Nitrobacter. Soil N° 11, 12 and 13 contain reasonably fair number of bacteria.

In case of Soil N° 9 and 13, the number of Nitrosomonas are 25 000 and 9 000 respectively. Fairly good number of Nitrosomonas are present in Soil N° 11 and 17, while low population of these bacteria is encountered in Soil N° 1 to 8.



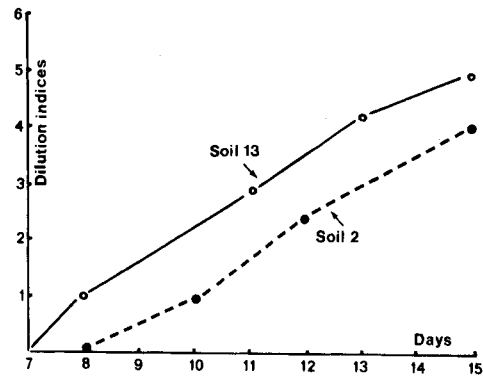
Graph 2 - Denitrification activity

Denitrification

There is a remarkable difference in the population of denitrifying bacteria in different soils. Their number vary from 40 in Soil N° 7 to as much as 11 millions in soil N° 3. Activity curve shows that denitrifying bacteria begin to develop after 4 days' incubation in case of Soil N° 2 and after 7 days' incubation in Soil N° 1 (Graph 2). Maximum biological activity is observed after 10 and 12 days' incubation in case of Soil N° 2 and 1, respectively.

Cellulolytic aerobic bacteria

Table 1 shows that population of cellulose decomposing bacteria is from zero in Soil N° 6 to 1.1 millions in Soil N° 13. Cellulolytic activity curve is presented in Graph 3. According to this curve, cellulolytic bacteria begin to multiply rapidly after 8 days' incubation in laboratory.



Graph 3 - Cellulolytic aerobic activity

Table II - Number of microorganism per gram of dry soil

Soil N°	Total microflora (millions)	Ammonifying bacteria (millions)	Nitrosomonas	Nitrobacter	Denitrifying bacteria	Cellulolytic bacteria (aerobie)
1	3 500	2 500	140	1 600 000	1 400	30 000
2	150	450	-	-	4 500	14 000
3	54	14 000	250	600 000	11 000 000	45 000
4	3 300	1 400	25	9 000	-	450
5	27	14 000	25	25	115	450
6	8, 3	160	-	-	1 500	0
7	2, 3	1 100	0	0	40	1 500
8	290	14 000	0	0	45 000	1 100
9	83	14 000	25 000	250 000	11 000	950
10	14, 3	14 000	250	250	1 500	14 000
11	29, 3	14 000	1 400	11 000	750	45 000
12	2, 9	14 000	1 400	17 000	4 500	45 000
13	3	14 000	9 000	16 000	4 500	1 100 000