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VERTICAL DISTRIBUTION OF ANTARCTIC SOIL ALGAE BY DIRECT OBSERVATION WITH THE CONTACT SLIDE METHOD (EXTENDED ABSTRACT)

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The dilution method has been commonly adopted for the counting of soil microbes, and the method has also been adopted for many soil algal studies in the Antarctic (CAMERON *et al.*, 1968; CAMERON and DEVANEY, 1970; BROADY, 1979a, b). Recently, the chlorophyll content of soil has frequently been applied to estimating the algal biomass as biochemicals (HOSHIAI and MATSUDA, 1979; FRIEDMANN *et al.*, 1980; BROADY, 1986; AKIYAMA *et al.*, 1986). However, these methods are not always adequate for studying soil algal ecology in the survey of vertical micro-distribution of algae under the Antarctic soil condition *in situ*. On the other hand, the contact slide method designed by COLODNY (1930, cited from MATSUGUCHI, 1975) has been known as a convenient method for direct counting of soil microbes under the condition *in situ*, and it was already adopted for Antarctic soil bacteriological study (VISHNIAC and MAINZER, 1972). However, little is known of the study of Antarctic soil algae using the method. In an attempt to obtain the details particularly of vertical micro-distribution of algae, the contact slide method was tried in this study.

Frosted slide glasses (*ca.* 76×26 mm) were set up in January 1988 at three sites along a stream in the Yukidori Valley, Langhovde, Antarctica, and they were collected in January 1989. At each site, slide glasses were buried at a few meters intervals from the stream shore along the line set at a right angle to the stream.

The occurrence of soil algae on the surface of each slide glass was recognized between the top portion of most of the slide glasses which corresponded to the soil surface and the lower portion of the slide glass which corresponded to the soil of 5 cm depth. Eleven taxa of Cyanophyceae, eight taxa of Chlorophyceae and four taxa of Bacillariophyceae were recognized (Table 1). Among them, *Actinotaenium cucurbita* and *Pinnularia borealis* dominantly occurred on the surface of the slide glasses at all of the researched sites. The algal cell numbers of dominant species ranged from 0 to 300 cells/mm^2. These values do not always correspond directly to the values of soil algal biomass obtained by means of dilution method, since the values obtained by the dilution method usualy give a cell quantity per volume or mass of soil, whereas the values obtained by the contact slide method show merely a cell quantity per area of vertically sectioned surface of soil. However, the values obtained by the contact slide method are closely related to the values of chlorophyll content of soil which were derived mainly from epipsamic algae at the same site (r=0.75).

Table 1. List of algae detected from the surface of the slide glasses buried in the Antarctic sandy soil.

CYANOPHYCEAE
Synechococcus aeruginosus NÄG.
**Synechococcus maior* SCHR.
Gloeocapsa magma (BRÉB.) KÜTZ.
Gloeocapsa ralfsiana KÜTZ.
Gloeocapsa compacta KÜTZ.
**Lyngbya martensiana* MENEGH.
Lyngbya sp. 1 (width=1 μm)
Lyngbya sp. 2 (width=3 μm)
Nostoc commune VAUCHER
Nostoc sp.
Stigonema minutum (AG.) HASS.
BACILLARIOPHYCEAE
Hantzschia amphioxys (EHR.) GRUN.
Navicula muticopsis VAN HEURCK
Navicula arcuata HEID. *et* KOLBE
**Pinnularia borealis* EHRENB.
CHLOROPHYCEAE
**Actinotaenium cucurbita* (BRÉB.) TEILING.
Stichococcus sp.
Coccoid alga no. 1 (diam.=10 μm; tetrads)
Coccoid alga no. 2 (daim.=10–16 μm; unicell)
Coccoid alga no. 3 (diam.=6–8 μm; colonies with gelatinous envelopes)
Coccoid alga no. 4 (irregularly shaped colonies composed of densely aggregated cells)
Coccoid alga no. 5 (colonies composed of 1, 2, 4, to 16 cells with thick colonial gelatinuous envelopes)
Filamentous alga

* indicates species dominant occurrence.

Horizontal distribution of soil algae along the stream showed a steep decrease in both chlorophyll content and cell numbers, from the water boundary area towards the site away from the stream.

The structure of algal communities, particularly their vertical micro-distribution, varied with site, viz. the depth showing a maximal algal growth at each site was as follows; −0.5cm (53 cells/mm^2) at site 1, −1cm (318 cells/mm^2) at site 2, and −2cm (555 cells/mm^2) at site 3.

Patterns of vertical distribution of each algal species varied with site, but the factors which determined their micro-distribution could not be clarified.

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