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# A PRELIMINARY REPORT ON THE ALGAL FLORA OF SOILS FROM SELECTED AREAS OF SHELBY COUNTY[1]

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## ABSTRACT

Twelve samples of Shelby County soil were assayed for the presence of soil algae by means of enrichment-, unialgal- and axenic cultures; fourteen genera of Chlorophyceae and five of Xanthophyceae were identified with certainty. Several apparently new taxa were taken into culture and these will be described in another report.

## INTRODUCTION

The existence of soil algae has been known from ancient times (Petersen 1935), but our present knowledge of their diversity and distribution is the result of investigations of the last 25 years. Petersen's classical report has given direction and inspiration to many phycologists interested in soil algae and it is also a valuable source for locating the early literature in this field. The bibliography in Lund's (1962) paper and that in the series of Phycological Studies by Bold and coworkers (Deason and Bold 1960, Chantanachat and Bold 1962, Mattox and Bold 1962, Bischoff and Bold 1963, Brown and Bold 1964) are good evidence of the increasing interest and the increased publications in this field in recent times. As ecological and evolutionary studies become more important to contemporary biologists, it is likely that the efforts of phycologists to provide information on the variation and distribution of soil algae will be of increasing interest. This trend points up the obvious need for adequately identifying and classifying the algae found in soil.

## MATERIALS AND METHODS

The present study is a preliminary survey of soil algae from certain selected types of soil in the Memphis-Shelby County area (cf. Cain 1964). Soil samples were isolated from two gardens located near the Poplar and Cherry Streets intersection; from two virgin forest areas, one in Shelby Forest and the other in Overton Park; and from two cultivated cotton fields near Shelby Forest. Approximately 10-gram portions of soil from each of these sites was placed in separate 250-ml jars, each containing 100 ml of sterile medium. One series of the 10-gram samples from each location was introduced into jars containing Bold's Basal Medium (BBM) (Bischoff and Bold 1963); another series of 10-gram samples was placed in BBM with urea, instead of $NaNO_3$, providing an equivalent amount of nitrogen. These media were used in order that a wide range of green (chlorophyceaen) and yellow-green (xanthophyceaen) algae might be recovered from the soil samples. The culture vessels were kept at approximately 22°C. with light of 500 ft-c intensity provided by two 20-w Ken-Rad "cool white" fluorescent bulbs for 12 hr. followed by 12 hr. darkness; these comprised the standard conditions of cultivation.

In two or three weeks, algae appeared at the liquid surface as phototactic rings and on the surface of the soil. Some of the algal material from each jar was plated-out or sprayed by compressed air onto separate sterile petri dishes containing BBM solidified with 1.5% agar. After a week or two, colonies, each consisting of a single algal taxon, were isolated into separate test tubes of BBM or the same medium enriched with Eagles' Vitamin mixture (Eagle 1955, 1959) and Vitamin $B_{12}$.

## RESULTS

Table I summarizes the genera of algae present in the soil from the different sites. Although soil was taken from Overton Park on two different occasions and from two different sites in Shelby Forest, only one sample of forest soil yielded algae. The shaded garden cultivated mostly for Azaleas, had a greater variety of species (Table I) than the unshaded rose garden.

In addition to the genera identified with certainty and listed in Table I, a number of apparently new taxa were found, isolated into axenic culture, and are currently being studied preparatory to describing them. These include a new genus of chlorosphaeracean algae, (to be described by Groover and Hofstetter), one species of *Hormidium*, and several taxa in the genera *Bumilleria* and *Heterothrix*.

In summary, 272 isolations of green and yellow-green algae were made from 12 soil samples. More than 20 genera were identified. As might be expected from the nature of the soil and of the selective media, the Chlorophyta which can tolerate a wide pH range (Lund 1962) were the most common. In all sites containing algae, *Chlorococcum* was present; *Spongiococcum* and *Spongiochloris* were found in all but one of the samples which contained algae. *Hormidium* was present at three sites; *Protosiphon* was found in only two places. The *Xanthophyceae* were represented by *Bumilleria*, *Heterothrix*, *Botrydium* and *Botrydiopsis*.

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TABLE I

SOME GENERA OF ALGAE OCCURRING IN SHELBY COUNTY SOILS.

| Gardens | | Cotton Fields | | Shelby Forest |
|---|---|---|---|---|
| $G_1$[a] | $G_2$[b] | $C_1$[d] | $C_2$[e] | |
| Chlorophyceae | Chlorophyceae | Chlorophyceae | Chlorophyceae | Chlorophyceae |
| Chlamydomonas (4)[c] | Chlamydomonas (1) | Chlamydomonas (2) | Chlamydomonas (1) | Chlamydomonas (3) |
| Chlorella (14) | Chlorella (4) | Chlorella (1) | Chlorococcum (3) | Chlorococcum (12) |
| Chlorococcum (24) | Chlorococcum (7) | Chlorococcum (16) | Chlorospyhaeropsis (2) | Chlorosarcinopsis (4) |
| Coelastrum (1) | Hormidium (6) | Dactylococcus (2) | Dactylococcus (1) | Tetracystis (3) |
| Dactylococcus (2) | Protosiphon (10) | Dictyochloris (1) | Hormidium (5) | Xanthophyceae |
| Hormidium (18)[f] | Spongiochloris (2) | Neochloris (4) | Neochloris (1) | Bumilleria (6) |
| Neochloris (2) | Spongiococcum (2) | Spongiochloris (18) | Protosiphon (4) | |
| Planktosphaeria (3) | Xanthophyceae | Spongiococcum (10) | Scenedesmus (1) | |
| Scenedesmus (2) | Botrydiopsis (2) | Tetracystis (1) | Spongiochloris (4) | |
| Spongiochloris (6) | Botrydium (3) | Xanthophyceae | Spongiococcum (2) | |
| Tetracystis (1) | | Botrydium (2) | Tetracystis (4) | |
| Xanthophyceae | | | Xanthophyceae | |
| Botrydium (5) | | | Botrydium (1) | |
| Heterothrix (9) | | | Bumilleria (6) | |
| Tribonema (2) | | | | |

[a] Shaded Azalea garden.
[b] Sunny rose garden.
[c] Numbers in parenthesis indicate the number of isolates made and give some indication of the frequency of its occurrence.
[d] Cotton Field at 8700 Riverbluff Road.
[e] Cotton Field at intersection of Garnet and Ward Roads.
[f] Including a new species to be described in a subsequent publication.

## DISCUSSION

The reasons for the absence of algae from three of four forest sites are not immediately apparent. It seems unlikely that the pH of the soil would account for the absence of algae in these samples, since soil algae are found over a fairly wide pH range (Lund 1962) and the soil itself usually changes the pH of the culture solution to its own value. The absence of algae from soil under forest litter is in accord with the conclusion of Petersen (1935) that there was a greater diversity of species on bare ground, whereas the algal flora was poorer on soil covered with moss or a dense phanerogamic vegetation.

Results from examination of the algal flora of the gardens was not in line with Petersen's findings, since the greater variety was found in shaded soil. In part, this result may be due to the presence in the samples from the latter garden of fungal contaminants which were a deterrent in making some isolations that otherwise would have been made. As would be expected from former observations (Lund 1962), diatoms and Cyanophyta were absent from the acid soil of the azalea beds; they were present in most of the other sites but were not isolated and identified. It was not possible to discern any pattern of distribution among the four areas containing cultivated soils. It is evident, however, that fertilized or cultivated soils contain a richer algal flora than do the soils from virgin forest areas, and this has been the experience of other investigators.

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