

Universities Research Journal 2008

Vol. 1, No. 1

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Contents

	Page
The Study of Fresh Water Algae from Kantharyar Lake, Pathein Township <i>Nyar Kyi, Mon Mon Lwin and Khin Min Min Phyo</i>	1
The Study of Selected Hydrophytes in Lake-pya-kan, Bago Township <i>Kyi Nyunt, Aye Mie Myat and San Nu</i>	25
Some Algae of Three Artesian Wells found in Ywathayar Village, Yinmarpin Township (Monywa District) <i>Theingi Htay</i>	37
Fresh Water Algae Found in Kalay University Campus and its Surrounding Areas <i>Moat War Dine Naw and Thein</i>	53
A Study on Usefulness of Some Woody Plants in Mon State <i>Eh Khu Hpaw, Win Win Nwe and Myo Hteik Aung</i>	63
A Study on Dyes Extracted from Natural Pigments of Some Resource Plants in Magway Township <i>May Than Su, Pa Pa Win, Kyaw Swe Lin and Thida Than</i>	85
Study on the Relationship of Plant Resin and Myanmar Society <i>Shwe Sin Ei</i>	101
Study on the Cultivated Legumes in Taungthaman Lake and Its Environ <i>Thai Thai Aye</i>	117
Effect of Direct-seeding and Transplanting Methods on Rice Cultivar Manawthukha in Meiktila Township <i>Nang Doi and Tun Chun</i>	133

	Page
Study of <i>Glycine max</i> Merr. on its Productions and Uses in Lashio Township <i>Swe Mar Tin, Thida Aung, Kay Thi Aung and Nang Mya Oo</i>	145
Ethnomedicines used by Mro Tribes in Kyauk-Taw Township, Northern Rakhine State for Gastrointestinal Disorder <i>Khin Thet Kyaw</i>	157
Some Edible Wild and Cultivated Plants Used as Food for Palaung Tribe in Kyaukme Township <i>Nyo Nyo Tin</i>	167
Genetic Diversity and Relationships Among the Myanmar Banana Varieties Using PBA Molecular Markers <i>Saw Yee</i>	183
Noncoding Pastid tRNA-Leu (trnL) Intron Region Sequences Report for Genetic Separation of <i>Cinnamomum spp.</i> from China and Myanmar <i>Khin Thantsin</i>	197
Culture of <i>Musa chiliocarpa</i> Back. in Murashige and Skoog Liquid Medium For Shoot Proliferation and Cell Types <i>Cho Cho Nyunt and San San Aye</i>	209
Studies on the Antifungal Agent Isolated from <i>Solanum indicum</i> Linn. Applicable for the Specific Treatment for Mycosis <i>Moe Moe Aye and Nyunt Phay</i>	221
Production of Antibacterial Metabolite by <i>Lecanicillium waksmanii</i> MKN-09 <i>Moe Moe Aye, Khine Swe Nyunt and Nyunt Phay</i>	231
Antifungal Compound Isolated from Leaf of <i>Cassia fistula</i> L. (Ngu Shwe Wah) <i>Khine Swe Nyunt, Moe Moe Aye and Nyunt Phay</i>	239
Investigation on the Isolation of Soil Fungi from Different Soil in Dawei Township	247

	Page
<i>Mar Lar Aung, Thi Thi Moore and Tin Tin Aye</i>	
Survey on Some Herbal Plants in Bago Yoma <i>Than Than Htay, Mar Mar Aye, Mar Mar cho and Yin Yin Waing</i>	257
Morphology and Preliminary Phytochemical Studies on Some Medicinal Plants Found in Pyay Area <i>Thet Thet May</i>	269
The Study of Some Medicinal Plants in Family Verbenaceae <i>Tin Thaw Oo</i>	283
Study on Some Medicinal Plants Concerning with Six Major Diseases (Phase I) <i>Thandar Oo</i>	295
Pharmacognostic Study on Fruits of <i>Terminalia catappa</i> L. (Banda fruit) <i>Shwe Shwe Hla</i>	311
Studies on Pollen Morphology of Some Flowers <i>Tin Kyi Kyi</i>	323
Preliminary Survey on Plant Species (Angiospermae) of Myeik Archipelago <i>Nwe' Nwe' Yi</i>	337

Fresh Water Algae Found in Kalay University Campus and its Surrounding Areas

Moat War Dine Naw¹ and Thein²

Abstract

Algae are very diverse photosynthetic plants that have neither roots nor leafy shoots and which also lack vascular tissues. They occur in marine, fresh water and also on the soil. They can grow extreme habitats such as hot spring and polar region. This study emphasized on the fresh water algae found in Kalay University campus and its surrounding areas. The aims of this study are to identify fresh water algae of these areas and to know the beneficial algae. Algae specimens were collected from ponds, lakes, canals and streams which are situated in the Kalay University and its surrounding areas. This study was carried out within two months, March and April, 2008. As results, the members of Cyanophyta, Rhodophyta, Bacillariophyta, Euglenophyta and Chlorophyta are described with their photographs.

Introduction

Algae are extremely important not only economically, but also phylogenetically. Now a day, algae are widely applied in many purposes all over the world. They are used as human nutrition, animal feed in aquaculture. The utilization of macroalgae or their extraction residues is the increase in water-binding capacity and mineral composition of the soil and thus they are used as biofertilizers. N₂-fixation with microalgae is important for rice production in tropical and subtropical agriculture. They promote germination, leaf or stem growth, or flowering. A future trend seems to be the use of biological activity of microalgal products against plant diseases caused by viruses or bacteria. It is likely that microalgae can be a source of a new class of biological plant-protecting substances. Algal polysaccharides are also of pharmacological importance. Moreover they are used in cosmetics production. In Germany, food production and distribution companies have started serious activities to market functional food with microalgae and cyanobacteria. Examples are pasta, bread, yogurt and soft drinks.

Moreover the floristic study is the most important field and the fundamental to study other branches of algal biology such as ecology,

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physiology and biomass culture. Many researchers worked the algal flora in many places of the world. Gilbert Smith worked the freshwater algae of the United States in 1950. Prescott, 1962 worked the algal flora with about 1000 species in eastern great lake area. In 1989-2000, freshwater algae of the Southeastern United States were done by Dillard. Skuja (1949) treated the algal flora of Burma with about 600 species. Similarly, in Myanmar, algal floras were done by Win Kyi (1973), Mya Mya Aye (1976), Mu Mu Thein (1976), Khin San Kywe (1982), Khin Phyu Phyu Aye (1982), Khin Myint Myint Tin (1992), Khin Nilar Than (1994), Lwin Lwin Oo (1995), Ni Ni Khaing (1995), Kyi Kyi Nyunt (1995), Theingi Htay (1997) respectively. This research was performed to complete the flora of Myanmar.

Material and Methods

Specimens were collected from ponds, lakes, canals and streams which are situated in the Kalay University and its surrounding areas. Some were collected from moist soil. The collected specimens were studied under the compound microscope (Olympus) in laboratory, Department of Botany, Kalay University. The specimens were measured with the help of micrometer. After that they were recorded by digital camera. Then they were identified according to Skuja (1949), Desikachary (1959), Prescott (1962), Philipose (1967), Komarek (1985-1990) and Dillard (1989-2000).

Results

Some dominant algal taxa are mentioned in this paper. Seventeen genera belong to five Divisions are as follow:

Division-Cyanophyta

***Chroococcus*. Naegeli**

One-celled, or an association of 2-32 spherical, hemispherical or ovate individuals, either free-floating or adhering to submerged substrates, or forming expansions in moist aerial habitats; each cell with a sheath which may be distinct, sheath either hyaline or ochraceous; cell contents homogenous or granular; not vacuolated, light to bright blue-green, olive-green or yellowish in color.

***Oscillatoria* Vaucher**

Filamentous and elongate, without a sheath; straight, or twisted and entangled; the mature plant showing a polarity with an apical region, which is often attenuated, the basal end truncate; trichome solitary and scattered, or forming expanded plant masses and slimy layers on submerged objects or on the bottom; microscopically usually showing an oscillating or gliding movement, especially active in the anterior portion of the trichome; apical cell smoothly rounded; or swollen and capitate, sometimes with a distinct sheath-like membrane, the calyptra; most species having cells much shorter than their width, with or without constrictions at the cross walls, which sometimes have a row of granules on either side; plants often living under semianaerobic conditions in stagnant water.

Filamentous composed of a uniseriate, unbranched trichome of cells inclosed by a non-gelatinous, more or less firm sheath; planktonic and solitary, or aggregated, forming entangled masses on substrates on intermingled among other algae; some species spirally coiled; trichomes mostly cylindrical throughout and tapering very slightly, if at all, toward the apices, which are usually not capitate.

***Anabaena* Bory**

Filamentous, mostly gregarious, much entangled and inclosed in amorphous mucilage, solitary and planktonic in a few species, sometimes attached and forming films and gelatinous expansions on moist substrates; trichomes straight, flexuous, or spirally coiled, either with or without a sheath; cells tubulose, barrel-shaped or cylindrical; heterocysts usually numerous and scattered in the trichome, spherical, ovate or cylindrical; akinets round ovate or cylindrical, either adjacent to or remote from the heterocysts.

***Nostochopsis* Vaucher**

Membranous or globular or irregularly lobed colony of tangled. Trichomes and lateral branches uniseriate; heterocysts lateral, mostly on the ends of short branches.

***Nostoc* Vaucher**

Membranous or globular or irregularly lobed colony of tangled, uniseriate unbranched trichomes of globose and bead-like, barrel shaped, or cylindrical cells, inclosed in copious, thick mucilage which outwardly forms

a firm integument, giving the colony a fixed and definite shape; individual sheaths of the trichome confluent with the colonial mucilage; trichome without basal-distal differentiation; made up of vegetative cells, frequent heterocysts and, when mature, gonidia which are either solitary or in series.

Division-Rhodophyta

***Batrachoapermum* Roth**

An attached, much branched thallus consisting of an axial row of large cells which cut off. Lateral units of definite intervals, thus determining node and internode regions; from these laterals a longitudinal investment of cortical filaments develop which more or less completely covers the axial row; cells in the axial row cylindrical, ovoid, ellipsoid, or fusiform in the branches terminating in short or long colorless hairs, entire thallus inclosed in a soft amorphous hyaline mucilage.

Division-Bacillariophyta

***Gomphonema* Ehrenberg**

Cells colony on the same main gelatinous stalk, valves straight, the upper half broader than the lower; raphe straight, transverse row of striates are present.

***Synedra* Ehrenberg**

Frustules elongate and straight, needle-shaped in both views, or with slightly capitate poles; pseudoraphe between transverse striate; frustules solitary or in radiating colonies, attached to substrate, singly or in clumps, at one end by short gelatinous stalks.

Division-Euglenophyta

***Euglena* Ehrenberg**

Cells solitary, fusiform, elongate-cylindrical, or ovoid, sometimes helically twisted, rarely slightly compressed, the posterior end rounded or produced, sometimes extending into a fine point or caudus, the anterior end usually narrowed and sometimes conspicuously 2-lipped, periplast either firm, giving the cell a rigid shape, or soft, the periplast decorated with fine spiral striations or rows of granules; a gullet and a reservoir in the anterior end from which arises a single flagellum of variable length; chloroplast one to numerous, discoid, ribbon-like or stellate plates, the margins entire or dissected, with or without pyrenoids; paramylon bodies a few, large or

numerous small rods, plates, rings or discs; stigma usually distinct at the anterior.

Division-Chlorophyta

***Cladophora* Kuetzing**

A repeatedly- branched filamentous thallus with basal-distal differentiation; attached when young but in some species becoming free-floating, forming feathery tufts on substrates, especially in flowing water; branching alternate, opposite, or sometimes di-or trichotomous, the branches smaller than the main axis, tapering slightly toward the apices; cells cylindrical or swollen; walls thick and lamellate in most species, sometimes thin and firm; chloroplast a parietal reticulum, pyrenoids present.

***Oedogonium* Link**

Attached, unbranched filaments. Cells cylindrical or enlarged toward the anterior end, where one or more ring-like scars resulting from cell division are usually apparent. Chloroplasts a parietal reticulum with many pyrenoids. Nucleus at the periphery of the protoplast. Swollen female cells present at maturity one to several in each filament. Male cells either short, compartment like cells, each bearing one or two antherozoid, occurring in filament the same size as those which bear the oogonia, or minute male filament growing epiphytically on the female plants. Fertilization by the entrance of an antherozoid through a pore or lid of the oogonium wall; resulting oospore of various shapes, surrounded by a wall of two or three layers, which may be smooth or variously decorated.

***Pediastrum* Meyen**

Colonies, free-floating, disc-shaped to stellate, generally of 4 - 8 - 16 - 32 - 64 or more polygonal cells arranged in a single layer. Colony with or without perforations. Marginal cells with one, two or four processes, rarely without such processes. Cell wall smooth, granulate or with reticulate ridges. Chloroplast parietal reticulate, filling the adult cells and with one or more pyrenoids. Cells multinucleate.

***Scenedesmus* Meyen**

Colony 2 - 4 - 8 - 16 celled, flattened, lying side by side in a single series or in a double row with the cells alternating, cells ellipsoid, ovoid or acicular, fusiform, crescent-shaped; cell walls smooth or with spines, teeth and ridges; chloroplast a parietal plate, usually 1 pyrenoid.

***Closterium* Nitzsch**

Cells solitary, these desmids are elongate, without a median constriction, lunate, bow-shaped, rarely straight, attenuated from the midregion to narrow, bluntly to sharply rounded, acute or truncate apices; cell wall smooth, striated, costate or punctate, some species exhibiting combinations of wall ornamentations, girdle bands often evident; chloroplasts 2, one in each semicell, connate with a number of longitudinal ridges, with 1 to many scattered or linearly arranged pyrenoids. At each pole of cell, there is a hyaline cytoplasmic region containing a conspicuous vacuole with vibrating granules. The nucleus lies in a bridge of cytoplasm connecting the two chloroplasts.

***Cosmarium* Cordaex Ralfs**

Cells solitary, with an obvious median constriction that is wide and shallow or deep linear and closed depending upon the species, form a short isthmus and two semicells, that are rounded in front view, but flattened, oval or elliptical in side view; the margin of the semicell is smooth, undulate, granulate, dentate, scrobiculate, or in some species, some combination of ornamentation; chloroplast 1 - 2 in each semicell, axial or parietal, with 1 - 2 conspicuous pyrenoids in each chloroplast.

***Spirogyra* Link**

Filaments long and unbranched, usually without basal-distal differentiation but sometimes with rhizoidal branches developing laterally where the filament comes in contact with substrate. Cells cylindrical, short to very long in some species, with plane, replicate, or colligate end walls. Chloroplast a parietal band or ribbon which may be spirally twisted or may be nearly straight, 1 to several in each cell, each bearing one to several pyrenoids.

***Chara* Linnaeus**

These plants are usually stout and coarse of texture, when compared with *Nitella*. They are frequently encrusted with lime and thrive best in hard or semi-hard water lakes and slowly flowing streams. It is this character which has earned for them the common name of stoneworts. The stem in most species is corticated by elements which develop from the node cell in both directions along the internodal cell and so meet cortical cells from the node above and below. The cortex consists of a row of longitudinal cells which may sometimes bear small 'spine cells'. In most forms, besides

bearing a whorl of leaves, the stem node is encircled by a single or double row of spine like cells, the stipulodes. The nodes of the leaves may be smooth or they may bear leaflets or bract (bracteoles). There are both monoecious and dioecious species. In the former condition the oogonia are always borne above the antheridia.

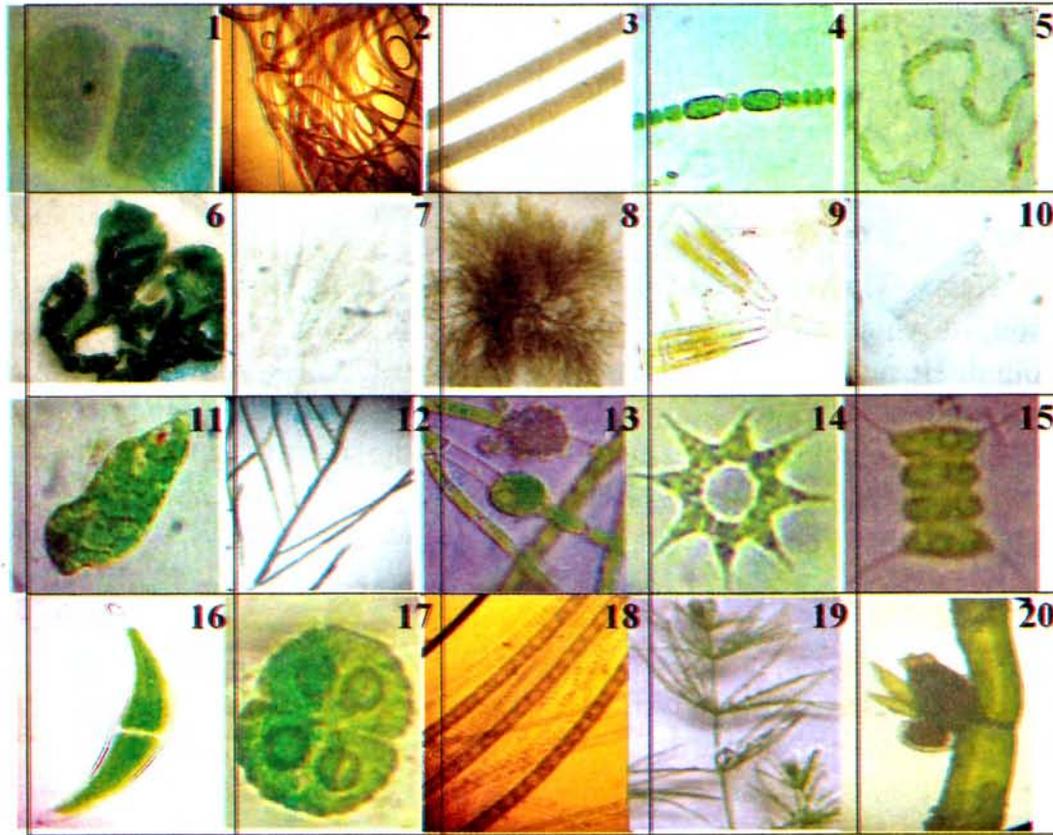


Fig. 1-20. Morphology of algae from study area.

1. *Chroococcus*
2. *Oscillatoria*
3. *Oscillatoria* (close up)
4. *Anabaena*
5. *Nostoc*
6. *Nostochopsis*
7. *Nostochopsis* (close up)
8. *Batrachospermum*
9. *Gomphonema*
10. *Synedra*
11. *Euglena*
12. *Cladophora*
13. *Oedogonium*
14. *Pediastrum*
15. *Scenedesmus*
16. *Closterium*
17. *Cosmarium*
18. *Spirogyra*
19. *Chara*
20. *Chara* (close up)

Discussion

According to literatures, there may be more than 25,000 species of algae are living every where. They range in size from a single cell to giant kelp over 150 feet long. In this study about seventy taxa were observed, only seventeen genera were described in this paper. The most abundant genera are *Spirogyra*, *Cladophora*, *Chara*, *Batrachospermum* and *Nostochopsis* in this summer season. The species of *Nostoc*, *Nostochopsis*, *Spirogyra* and *Cladophora* are edible and the people from Kachin and Shan State are eating these algae as food.

Conclusion

Kalay University is situated between Chin State and Sagaing division, in which a plenty of ponds, lakes, ditches, rice fields and streams are found. Because of the presence of these, different kinds of algae were found abundantly. So, the good chance was achieved to study the interesting algae. This research may aid to the person who interested the algae and other applied algal researchers.

Acknowledgement

We would like to thank Professor U Aung Myint Thein, Department of Botany and Rectors, Kalay University, for their permission to carry out this research.

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