Universities Research Journal 2008
Vol. 1, No. 1

Editorial Board

Prof. Daw Thai Thai Aye, Head of Department of Botany, University of Yadanabon
Prof. Daw Tin Ye, Head of Department of Botany, University of Meiktila
Prof. Nay Win, Head of Department of Botany, University of Kyaukse
Prof. U Aung Myint Thein, Head of Department of Botany, University of Kalay
Prof. Swe Mar Tin, Head of Department of Botany, University of Lashio
Asso. Prof. Dr. San San Aye, Head of Department of Botany, University of Kyainge Tong

Contents

Some Algae of Three Artesian Wells found in Ywathayar Village, Yinmarpin Township (Monywa District)

Theingi Htay

Abstract

In this paper, concern with knowledge of artesian wells and some fresh water algae. Deep wells drilled into rock to intersect water table and reaching for below it are called artesian wells. Algae samples were collected from three artesian wells found in Ywathayar village, Yinmarpin Township (Monywa District), Sagaing Division. The morphological characteristics of some algae and water analysis are also expressed. Seven species belong to 6 genera of Chlorophyceae, 15 species belong to 6 genera of Cyanophyceae and 5 genera of Bacillariophyceae have been identified and described with photographs.

Key words: Artesian wells, freshwater algae, Cyanobacteria

Introduction

Water constitutes one of our most valuable natural resources, without it no form of life is possible. So people from ancient time got and used water from rivers, streams, lakes and wells. Water from wells is ground water. If a confined aquifer is tapped by the well, water will rise above the top of the aquifer and may even flows from the well onto the land surface. Water confined in the way is said to be under artesian pressure, and the aquifer is called artesian aquifers.

The word artesian comes from the town Artois in France, the old Roman city of Artesium, where the best known flowing artesian wells were drilled in the middle ages. An artesian aquifer is a confined aquifer containing ground water that will flow upwards out of a well without the need for pumping. If the well is drilled from the land surface into the ground water layer by using tube and pumping machine, is called tube well. If well is drilled through the tube to the land surface into the aquifer, the water will rise up automatically to the land surface without pumping machine. This kind of well is caused by its own water pressure, called the artesian well.

The sources of water for Ywathayar, artesian wells are Alawngdaw kassapha wild reserve national park on the north and Pondaung ponnya hill

Associate Professor, Department of Botany, Kyaukse University

on the west. The rain water from those places sinks into the impervious soil and drains along the slope till to the Chindwin river. Ywathayar people drill the impervious soil to get water and get the over-flow water, artesian wells. They made the reservoirs to keep water. They use the water from those reservoirs for growing paddy, beans, peas etc. The water from those reservoirs diluted the mineral and chemicals from soil layers. By observing the content minerals we can guess the minerals, we can find near the environment of Ywathayar. So we can also make research upon the algae found in Ywathayar reservoirs. Researching on those algae, we can get the results of advantages and disadvantages.

Fresh water lakes, ponds and streams contain similar botanical gardens of planktonic microalgae and attached forms. Freshwater algae display a wide diversity of forms and functions. Oceanic and freshwater environment, some algae have adapted to extreme habitats such as hot springs and lakes. Conspicuous blooms of microscopic algae occur in marine and freshwaters, often in response to pollution with nutrients such as nitrogen and phosphate. Nutrient pollution can usually be traced to human activities, such as discharge of effluents containing sewage or industrial wastes, or the use of agricultural fertilizers.

Algae are abundant and ancient organisms that can be found in virtually every ecosystem in the biosphere. Also algae are aquatic organisms that are photo-synthetic, oxygenic autotrophs which are typically smaller and structurally complex than land plants. It is possible to clearly distinguish algae from plants, animals and fungi. Some of the common types of algae growth forms in addition to the basic modes of sexual and asexual reproduction in algae. Many algae occur as unicell which others may be made up of several to many individual cells held together as colony. Some unicellular algae are non motile and some are motile with flagella. A common growth form among the algae is the filaments which are branched or unbranched.

Color variations reflect differences in the types and amounts of blue-green, red, orange and golden accessory pigments accompanying the green of chlorophyll. Sandy tropical shallows may also contain extensive microbial mats composed of an interwoven community of Cyanobacteria (blue-green algae), diatoms and other microorganisms.

In this research, an attempt has been made to contribute the knowledge of freshwater algae of different in artesian wells found in

Ywathayar village, Yinmarpin Township, Sagaing Division. Yinmarpin Township is located at the west of Monywa and Chindwin River. Ywatharyar is one of the villages in Yinmarpin Township. 99 artesian wells are found in Yinmarpin Township. Among them 10 artesian wells are found in Ywatharyar village and its environs.

In this present study, the samples of algae and water from three artesian wells were emphasized. Myittakan or No.1 well is location I, N. 46 well (north of the school) is location II and Ywalaekan (middle of village well) is location III.

The aim of the present work were to investigate to species of some freshwater algae in three artesian wells of Ywathayar village, Yinmarpin Township, Monywa District and to test water quality of samples from three artesian wells. Cyanobacteria are found abundantly in all locations.

Materials and Methods

There are eight Townships in Monywa District, Sagaing Division. Yinmarpin Township is one of them and located at the west of Monywa and Chindwin river. Algal specimens were collected from (3) artesian wells of Ywatharyar, Yinmarpin Township, Monywa District (Map). They were carried out with plastic bottle to the laboratory, Department of Botany. The morphology of these microalgae was studied under the compound microscope (Olympus) and measured the specimens by micrometer. After that the photographs of algae were taken by digital camera. Then, they were identified on the basic of Prescott and others phycological references. The specimens were preserved with 5% formalin in Department of Botany, Mandalay University. Some algae were cultivated in the lab.

Water analysis was carried out at water laboratory, water and sanitation Department of Mandalay City Development Commette, Public health laboratory, Mandalay.

Results

Taxonomic Studies of Some Algal Flora

Classification of Species Studied

1. Division – Chlorophyta

Class – Chlorophyceae

Order – Ulorichales

Family – Ulotrichaceae

Genus – Ulothaix

Species – *Ulothrix subtillisima* Robenhorst, 1968.

Filaments long and slender, free-floating or attached, cells very slightly inflected and constricted at the cross walls, cells 4-5μm in diameter, 11-14.8μm long Chloroplast extending the entire length of the cell.

2. Order – Chlorococcales

Family – Hydrodictyaceae

Genus – *Pediastrum*

Species – *Pediastrum ovatum* (Ethr.) A. Braun, 1855.

Colonies usually 4–8–16 celled, with the cells arranged in a ring round a central space or one or more interior cells and a number of marginal cells, perforate or almost imperforate, the perforations being small, 8–12 μm broad, 15–20 μm long.

3. Family – Oocystaceae

Genus – *Chlorella*

Species – *Chlorella valgaris* Beyerinck 1890.

Cells spherical, scattered among other algae or sometimes occurring in almost pure growths; chloroplast a parietal up, sometimes without a pyrenoids; cells 5–8.5μm in diameter.

4. Family – Scenedesmaceae

Genus – *Scenedesmus*

Species – *Scenedesmus dimorphus* (Turp.) kuetzing, linnaea, 1833.

Colonies 4 to 8 celled arranged in a linear or subalternating series. Cells 3.5–5μm in diameter, 16–18μm long; more or less lunate and the apices of the cells being attenuated; inner cells straight, sharp apices. Cell wall is smooth.

5. *Scenedesmus bijugatus* var *alternans* (Reinsch)Hansging, 1888.

Colonies 4 or 8 celled, usually flat, free-floating. Cells 5–6 μm in diameter, 8–10 μm long ellipsoid to ovoid–ellipsoid and arranged in two alternating series; adjacent cells in contact only along a short portion of their length. Cell wall smooth.

6. Order – Zygnematales

   Family – Zygnemataceae

   Genus – *Spirogyra*

   Species – *Spirogyra pratensis* Transeau, 1914.

Filaments of slender cells, 17–20μm in diameter, 80–95μm long, with plane end walls; chloroplast solitary (rare 2). Conjugation by tubes from both gametangia; zygospores ovate, spore wall smooth.

7. Family – Desmidiaceae

   Genus – *Cosmarium*

   Species – *Cosmarium raniforme* (Ralfs) 1934.

Cells large, cell 15–25μm in diameter, 20–30μm long; sinus deep and dilated at the apex; semicells reniform with truncate apex; chloroplast axile; one in each semicell.

8. Division – Cyanophyta

   Class – Myxophyceae

   Order – Chroococcales

   Family – Chroococcaceae

   Genus – *Synechococcus*

   Species – *Synechococcus aerugìnosus* Naegel 1849.

Cells oblong cylindric, 2–3 times their diameter in length, poles broadly rounded; solitary or in paris; 7–15μm in diameter, 19–25μm long.

9. Order – Nostocales

   Family – Oscillatoriaceae

   Genus – *Oscillatoria*

   Species – *Oscillatoria tenuis* C.A.Agradh, Alg-Dec-2:25, 1813.

Trichomes aggregated to form a blue-green mass, straight or slightly flexuous, not tapering toward the apex. Apical cell convex, smooth and not capitate. Cells 5–6μm in diameter, 2.5–3μm long, constricted at the cross wall, granulated.

10. *Oscillatoria granulata* Gardner 1927.

Trichomes aggregated to form an expanded plant mass; straight or curved. Apical cell not capitate and without a calyptra. Cells 3–5μm in diameter, not constricted at the cross walls, which are distinctly granular.

11. *Oscillatoria angustissima* West & West 1897.

Trichomes much entangled to form light blue-green plant mass, apical cell bluntly rounded, not capitate and without calyptra; cells 0.6–1.0μm in diameter, not constricted in cross wall.

12. *Lyngbya aestuarii* (Mert.) Liebmann. 1841.

Plants aggregated, entangled, forming extensive layers on submerged substrates, or upon moist earth and stones; sometimes becoming free-floating filaments varying greatly in diameter, 10–26μm wide. Trichomes 5–20μm in diameter, tapering a little at apices or capitate. Cells 2.5–5μm in length, not constricted at the cross walls. Sheath, firms becoming thickened, lamellose, olive-green in colour.

13. *Lyngbya Martensiana* Meneghimi, 1837.

Plants much entangled and inter-woven to form an expanded, dark blue-green mass; trichomes 6–10μm in diameter, not tapering toward the apices, 2.5–2.8μm long, not constricted at the cross walls, sheath firm, filaments 6–10μm in diameter.

14. Family – Nostocaceae

Genus – *Anabaena*

Species – *Anabaena affinis* lemmermann 1898.

Trichomes straight or flexuous, solitary and free-floating, either planktonic or intermingled with other algae, cells spherecal to spheroidal with either homo-geneous contents or with pseudovacuoles, especially the later when plants are solitary in the plankton, 5–7μm in diameter; heterocysts spherical, slightly larger than the vegetative cells, 7.5–10μm in diameter.

15. Family – Scytonemataceae

Genus – *Scytonema*

Species – *Scytenema archangelii* Bormet Flahault 1887.

Filaments in fascicles or tufts, forming brownish or gray mats and cushions. Trichomes with long and sometimes with false branched. Cells quadrate; without constriction at the cross walls; 12–18μm in diameter, 14–20μm long. Sheaths thin, close, hyaline. Filaments 12–16μm in diameters.

16. Family – Rivulariaceae

Genus – *Rivalaria*

Species – *Rivularia haematities* (D.C) C.A. Agasdh 1824.

Filaments rooted in attached, in densed colonies frequently gregarious and agglutinate to form an expanse as much as 3 cm thick, filaments closely arranged and semiparallel; individual sheaths conspicuous below, firm and close; cells 4–7.5μm in diameter. The diameter in length in the lower part of the trichome.

17. Division – Chrysophyta

Class – Bacillariophyceae

Order – Pennales

Family – Fragilariaceae

Genus – *Synedra* Fhrenberg. Phys. A bh, wiss. z.

Cells solitary or radiating or fan-shaped colories, free–floating or epiphytic, sessile or attached by a gelatinous stalk. Frustule linear, sheet rectangular and straight, sometimes curved in valve view, with and attenuated or of some diameter as the median portion. Chromatophores variable, many small plates or two large plate-like structure, each with three or more pyrenoids.

18. Family – Naviculaceae

Genus – *Stauroneis* Ehrenberg, 1843.

Cells solitary, and freé-floating, gradually attenuated towards the poles, rounded or rostrate apices. Valves with slightly radiate parallel striae or rows of punctae. Raphe present, distinct, axile, straight with small and central and polar nodules.

19. Genus – *Gyrosigma* Hassall. 1845.

The characteristic features of this genus or the sigmoid curvation of axial field and raphe, and the value having transverse and longitudinal rows of punctae. Valves sigmoid in outline, gradually attenuated toward the acute or broadly rounded poles. The raphe sigmoid, with small central and polar nodules. Valve with two systems of parallel lines that cross one another at right angles.

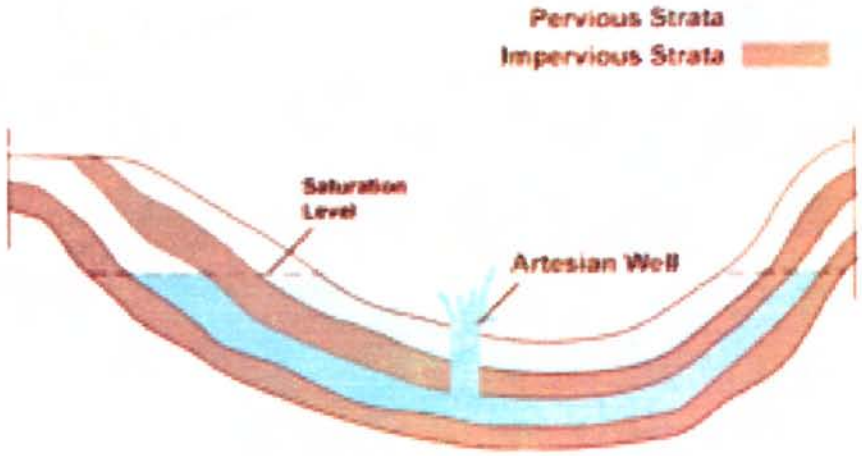
20. Family – Cymbellaceae

Genus – *Cymbella*

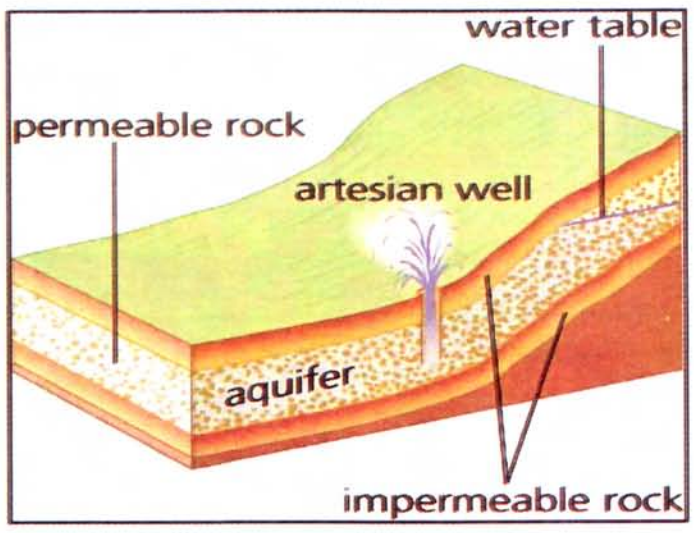
Cells solitary, free–floating or epiphytic. Frustule longitudinally assym-metrical in valve view and with a lunate. Valve lunate, gradually attenuated from the middle to the broadly rounded or acute polar.

21. Genus – *Amphora* Chrenberg. 1840

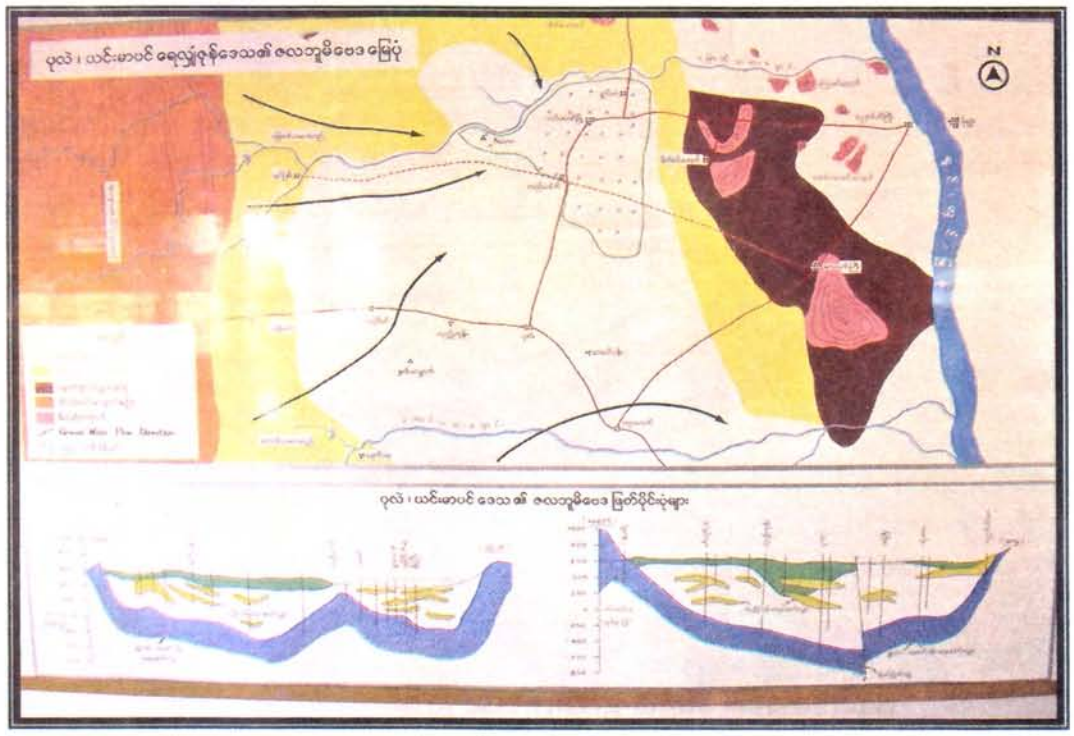
Cells solitary, free-floating, sessile and with their concave face attached to the substratum. Frustule longitudinally assymmetrical, lunate subnaviculate or sub rhom-boid in valve view, broadly elliptical and width truncate and girdle view. Valve with punctate or striae. Raphe gibbous instead of a smooth curve, with central nodule very close to the concave margin of valve.



Geological strata giving rise to an Artesian Well



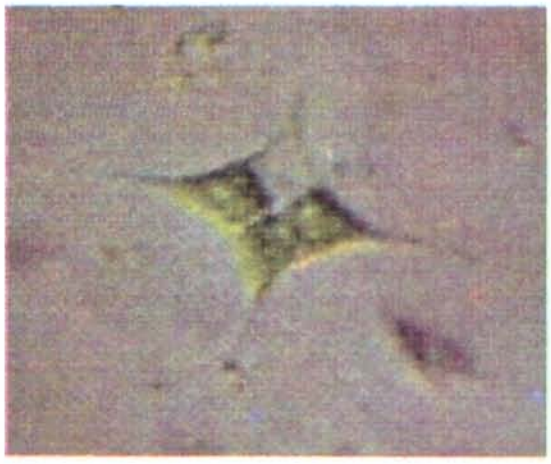
Precision Graphics Artesian Well



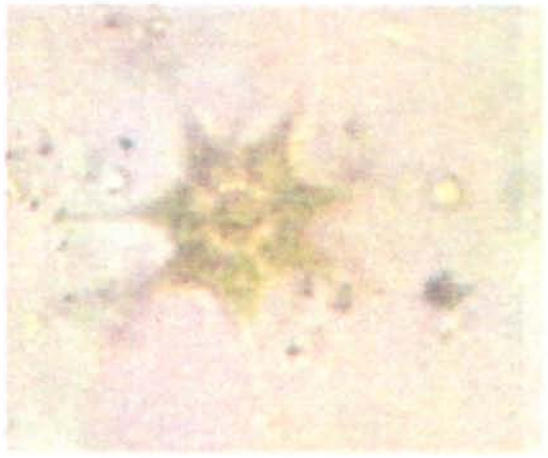
Location 1

Location 2

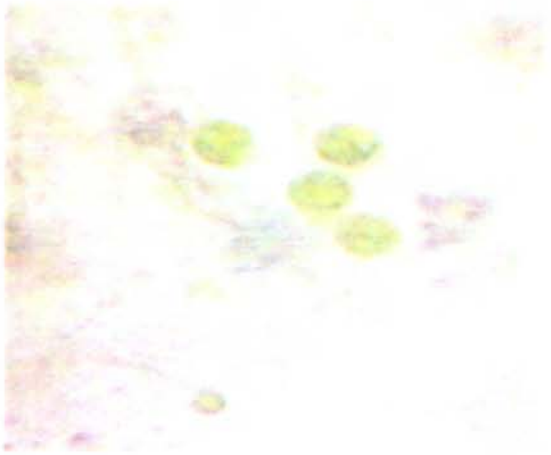
Location 3



Pediastrum ovatum× 500



Pediastrum ovatum× 500



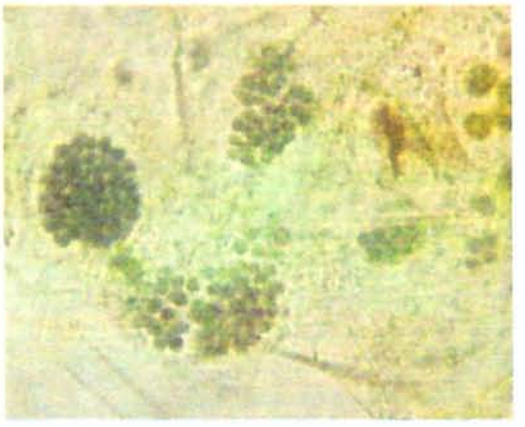
Chlorella valgaris× 500

Scenedesmus dimorphus× 500

Scenedesmus bijugatus var. alternans

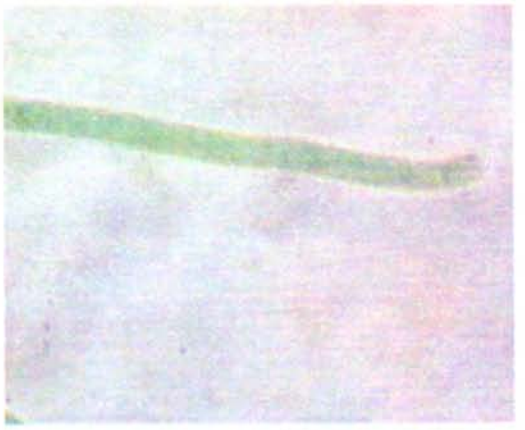
***Spirogyra pratensis*× 500**

Cosmarium raniforme× 500

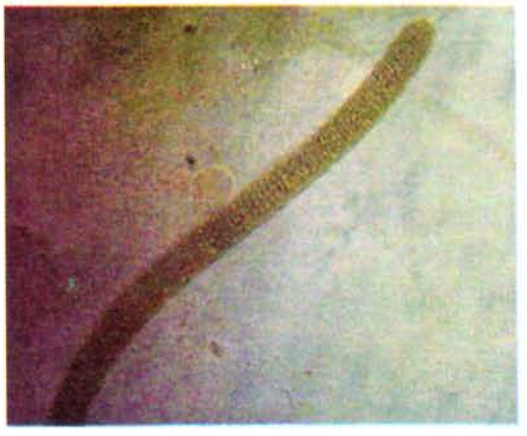


Synechococcus aeruginosus× 500

Oscillatoria tenuis× 500

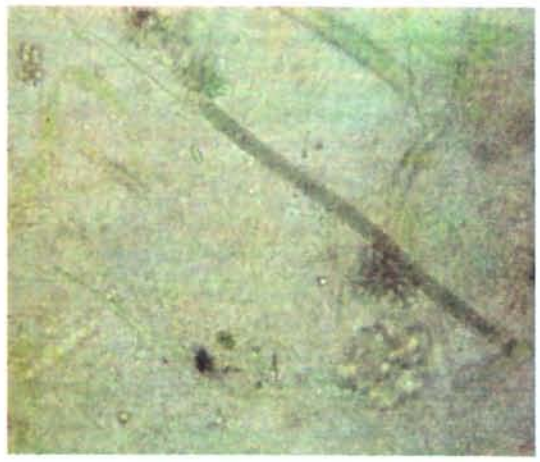


Oscillatoria angustissima× 1000

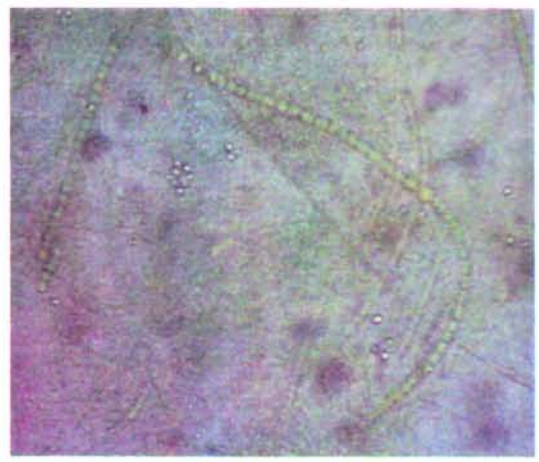


Oscillatoria granulata× 500

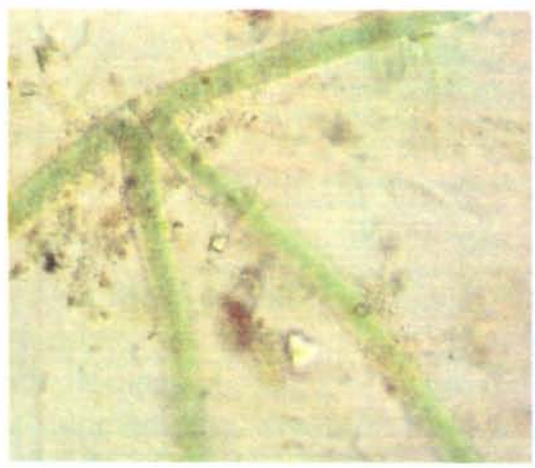
Lyngbya aestuarii× 500



Lyngbya martensiana× 500

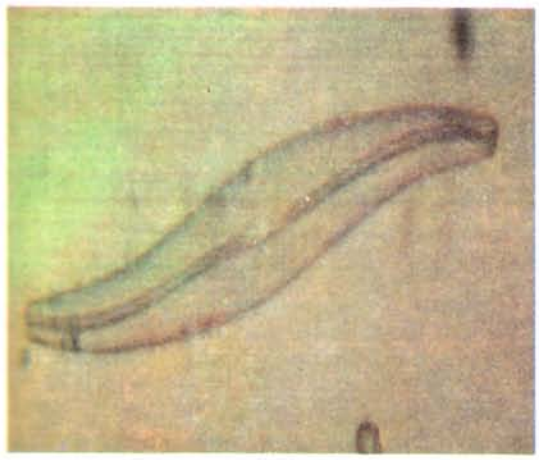


Anabaena affinis×1000

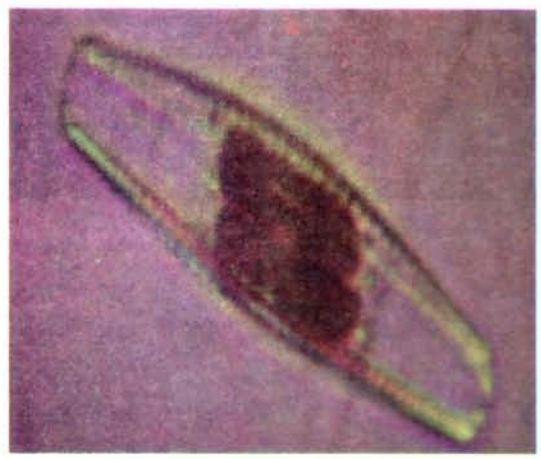


Scytonema archangelii× 500

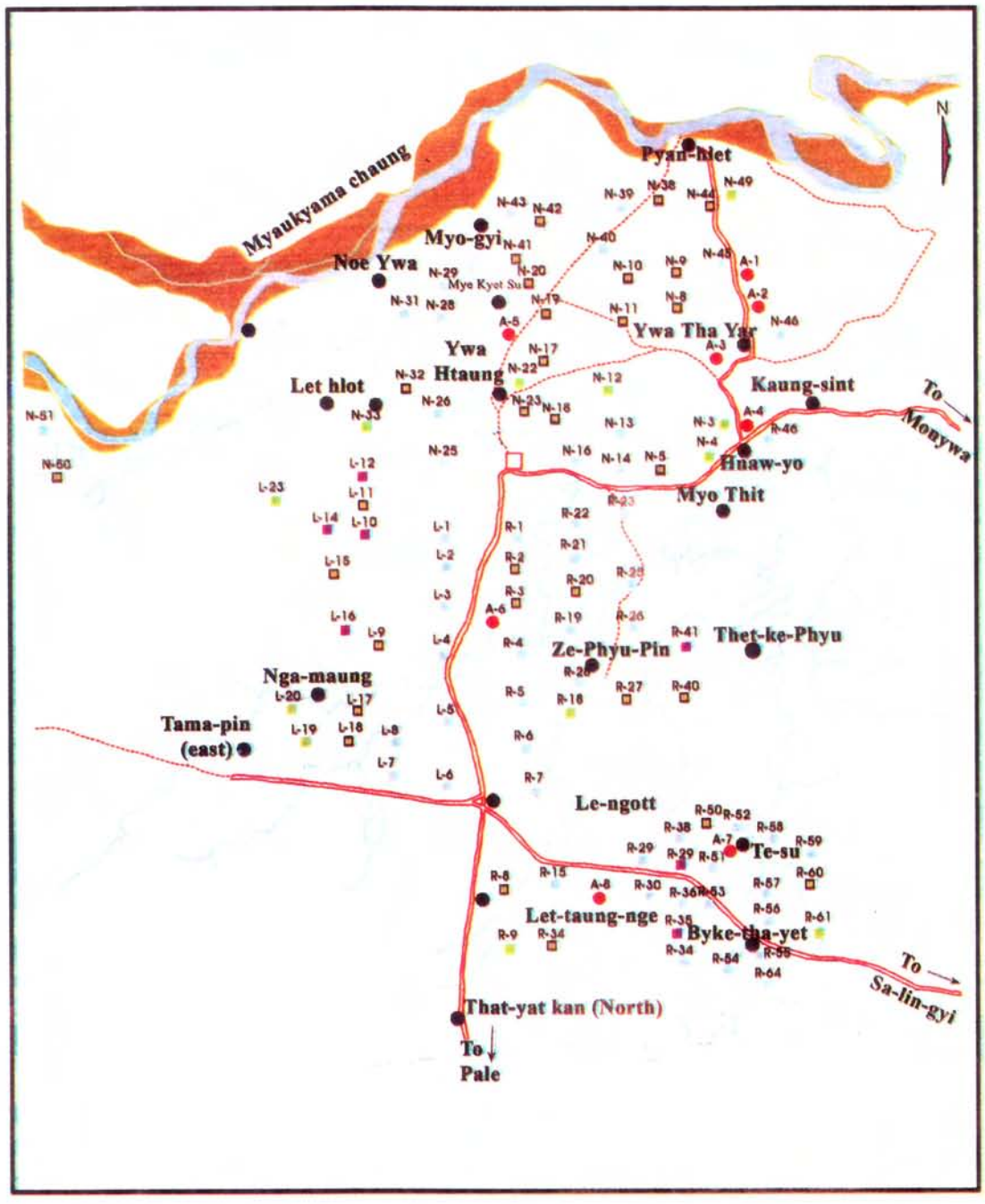
Stauroneis× 500



Gyrosigma× 500



Synedra× 500



Location Map of 99 Artesian Wells found in Yinmarpin Township, Monywa District

Discussion and Conclusion

In this study area, *Oscillatoria*, *lyngbya*, *Anabaena* and Diatoms were abundantly in all locations. *Chlorella* was abundant only in Location III (Ywalekan). *Scenedesmus* was also abundantly found both in locations I (No.1. Myittakan) and location III (Ywalekan) and rare in location II (N. S. well).

Pediastrum and *Scytonema* were only found in location I. (No.1. Myittakan) and absent in location II and III. *Rivularia* was commonly found in only location III. Most of the cyanobacteria were commonly found in all locations. Among Chlorophyceae, *Ulothix* and *Cosmarium* were only found in location II.

It may be concluded that blue-green algae and diatoms were growing abundantly in all locations and the class Chlorophyceae was judged to be second representative of algal flora. Among them, *Chlorella* were abundant only in locations III (Ywalekan).

In all locations of artesian wells found in Ywathayar, the members of Bacillariophyceae may be regarded as the most abundant algae.

Most of the problems in drinking water supplies, associated with tastes and odors are due to the presence of variety of algal species and certain other microorganisms in the raw water source. Several algae secrete oil type substances which impart particular tastes and odors to the water, e.g. *Oscillatoria*, *Rivularia*, *Cosmarium*, *Pediastrum*. *Scenedesmus*, *Anabaena*. Then, *Anabaena* and *Rivularia* can affect the cattle death due to produce toxic substances. These toxins can cause allergic, high fever, severe headache and pain in muscle and joints. Long term chronic effects of these toxins include damage to liver or liver tumour promotion (Falconer, 1999; Chorus *et.al*., 2000). And then, *Anabaena* was the responsible organism in ten children who developed diarrhea and vomiting a day after bathing in algae-covered long lake.

Substances of commercial importance, such as alginates for paint, foodstuffs and fertilizers, have been extracted. *Chlorella* and its various strains by the ton for animal feeds and possibly for human food. The specificity of quantities of protein and the differences in kinds of chemical substances produced *Chlorella* may be an aid in differentiating species and varieties. The protein is especially rich in the amino acids lysine, threonine and tryptophan, which are generally poor in cereal proteins (Lees &

Rosenbaum, 1987). The use of Cyanobacterial bio-fertilizers, especially for growing rice, is promising (Kannaiyan et.al., 1997). In terms of ultimate nitrogen input in the paddy, algalization is feasible at about one-third of the cost of a chemical fertilizer. Bio-fertilization by blue-green algae can also be done indirectly by using the hererosporous floating aquatic ferns of the cyanobacterium *Anabaena azollae.*

Some Cyanophycean microalgae have properties that make them good soil, especially in tropical and alkaline soils as well as in some deserts. They can help to improve soil structure and alter the surface tension of water.

References

Anagnastidis, K. & J. Komarek (1985): **Modern approach to the classification system of the Cyanophytes 1.** Introduction. Algol. Stud. 38/39 : 291-301.

Anagnastidis, K. & J. Komarek (1986) : **Modern approach to the classification system of the Cyanophtyes 2.** *Chroococcales.* Algol. Stud. 43/157.226.

Anagnastidis, K. &. J. Komarek (1989) : **Modern approach to the classification system of the Cyanophytes 3.** *Oscillatoriales.* Algol. Stud. 05-52 : 327-472.

Baldwin H.L and Mc Guinness C.L (1963): US Geological survey. A primer an Ground Water.

Desikachary, T.V (1959). **Cyanophyta, Indian Council of Agricultural Monograps on Algae.** New Delhi. Dinel F. Jakkason (1964). Algae and Man.

Freeze R.A and Cherry J.A (1979). **Ground Water. Prentice Hall.**

Heath R.C (1983). **U.S Geological Survey Water Supply Paper. Basic Ground Water.**

Hohn Willey (1959). **Hydrology.** New York and London.

Lianda E. Grahm, Lee. W. Wilcox. (2000): **Algae.** Wisconsin University Prentic-Hall, Inc. Upper Saddle River, NJ 07458.

Massyuki Watanabe (1992): Studies an planktonic. **Blue-green-algae** 4. Some Ana baena species with straight trichames in Janap.

Pres cott, G.W (1951); **Algae of the Western Great lakes Area.** Carnb-root.

Skuja. H (1945): Flora of Burmas.

Ven den Hoek, C., Mann, D. G and Johns. H.M. (1995): **Algae;** An Introduction to Phy cology. Cambride University Press, 62 & pp.