



SILICON CARBIDE STRIP AS A SIMPLE AND EXCELLENT TOOL FOR PELAGIC PLANKTONIC DIATOM BAITING

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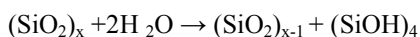
ABSTRACT

Diatoms are of major interest to scientists. They play an important role in maintaining ecological balance. They use nitrogen, phosphorus and silicon for photosynthesis and for development of their frustules. The intriguing patterning of biosilica on their cell walls makes them an important object of study in nanotechnology. They are beneficial in synthesis of biosilica and other bio materials, which find their use in electronics, biomedical applications, drug delivery and varied other areas. Diatoms help in biomineralization, waste degradation and toxicity indication. They have a huge industrial application. There are various devices for collecting and study of diatoms in water bodies. In this study we explored silicon carbide strips of two different sizes (80 grit and 100 grit) to find out their efficacy in concentrating pelagic planktonic diatoms on their surfaces in water bodies. This novel approach may help us in easy collection and for straightforward determination of the prevalence of different species of diatoms in a locality. After analysis of the data originated from this study we found that they can concentrate diatoms ~10 times after 48h exposure in water bodies and 100 grit variety is better than the 80 grit type.

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INTRODUCTION

Diatoms are single celled, photosynthetic, eukaryotes, which are available in abundance in all forms of water bodies. Their cell walls are composed of transparent material namely Opaline silicate. This makes the diatom skeleton visible under light microscope. Diatoms are of major interest to scientists as they play a pivotal role in maintaining ecological balance. They are responsible for 40 per cent of marine primary production and are of key importance in regulating silicon cycle[1]. Silica is available in abundance on the earth's crust. Silica remains dissolved in water following the equation –



Diatoms are known to uptake, transport and process monosilicic acid and result in formation of biosilica. Diatoms use Silicon Transporter (SIT) protein for taking up silicon through aerobic processes and synthesize them in Silicon deposition vesicles (SDV) [2,3]

Silicon Carbide is a semiconductor material composed of Silicon and carbon. Silicon carbide occurs as moissanite which is available in meteorites. Synthetically it can be produced by heating in excessive carbon with silica (SiO_2) [4].

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Silicon carbide (SiC) strips are mainly used for sanding purpose. SiC strips are available commercially in different grit sizes. In this experiment we used SiC strips of grit sizes 100 and 80 to observe whether they could entrap diatoms on them.

Abrasive measurement specifications of SiC strips :-

1. 80 grit 0.0065 inches (average) 165 micron (average)
2. 100 grit 0.0048 inches (average) 122 micron (average)

MATERIALS AND METHODS

We collected water samples from pond and from swampy pool in different containers (C1, C2, S1, S2) such that C1 and S1 contained water from pond and C2 and S2 contained water from swampy pool.

In containers, S1 and S2 silicon carbide strips (used as baits) of two different grit size were immersed in different lots. We used SiC strips of grit sizes 80 and 100 cut into 2 cm x 1 cm sized pieces so that their impressions can be studied easily on glass slides under the microscope.

The strips were placed inside the water bodies for 48h. After 48 hrs, the SiC strip baits were separated using forceps and the impression of the each of the strips were taken on separate microscope slides. A drop of water sample from each of the containers was also taken on different microscope slides. All the slides were observed under a light microscope (100x) to

find out average number and types of diatoms per 10 microscopic fields..

RESULT

The analysis of the data showed a powerful diatom concentration efficacy of silicon carbide strips from water bodies, they attract the pelagic planktonic diatoms in water bodies. However, after concentration by silicon carbide, decreasing potency of diatoms in free water was not parallel with it (Fig.1 and Fig.2). In general pennate diatoms were more in the water bodies which were studied in this experiment. The diatom population density was over 10 times more than that observed in the free water samples. Also, more diatoms were baited on the 100 grit sized SiC strip as compared to the 80 grit sized strip.

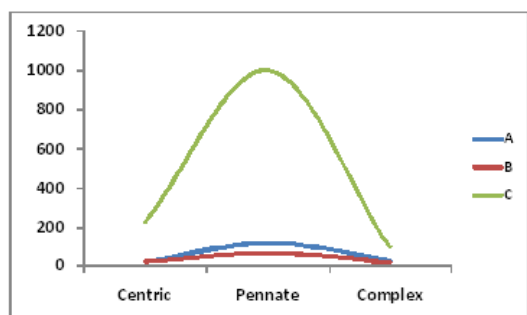


Fig.1 Showing concentration of different types of diatoms after silicon carbide baiting in water bodies. A. Free water diatom counts in which silicon carbide strips were not applied. B. Free water diatom counts in which silicon carbide strips were applied. C. Diatom counts in silicon carbide strip impressions on glass slides after baiting. (counts per 10 microscopic fields x100 magnification)



Fig.2 : Some centric and pinnate diatoms in the water bodies

DISCUSSION

In the observed samples, *Nitzschia* sp was found to be present predominantly (about 60%) followed by *Cyclotella* sp and *Utonia*. There has been no significant increase in the population of the diatoms present in the baited free water sample, in fact the number of diatoms decreased due to baiting. The *Nitzschia* sp population decreased drastically in baited free water sample. Conditions such as low Si:P ratio tends to create a silicon limiting environment in ponds and lakes [7].

Low dissolved silicic acid concentration also causes a Si limiting environment. *Nitzschia* sp grows poorly in Si limited environment [5,6,7]. Hence it can be inferred that Silicon Carbide does not convert to Silicic acid (active silica) which would be required for the growth of the diatoms. However, it successfully entraps the diatoms. Therefore, from this experiment it can be concluded that Silicon Carbide strip can be used as an efficient bait for entrapping diatoms; 100 grit sized strip is the ideal choice.

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