Periphytic Algae of Dagwan Stream in Dachigam National Park

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ABSTRACT

Periphytic algae of Dagwan stream in Dachigam National Park were studied in terms of species composition and density at four selected sites for a period of 6 months. Periphytic algal community was represented by 27 taxa, belonging to four families namely Bacillariophyceae, Chlorophyceae, Cyanophyceae and Chryrsophyceae. The mean monthly density of periphytic algae was recorded highest for Site I (1022 ind./cm^2) and least for Site III (796 ind./cm^2). Overall, Bacillariophyceae was the most abundant group (55%) and Chrysophyceae the least abundant (1%), being represented by only 1 taxa at Site IV. At lower stretches of the stream, the periphytic assemblage was dominated by blue-green algae (Cyanophyceae) which indicates the polluted nature of the site situated outside the official boundaries of the national park.

Keywords: Periphytic algae, density, dagwan stream, Dachigam National park

INTRODUCTION

Periphyton or *Aufwuchs*, comprise the organisms living on submerged substrate. These include both the attached forms and the organisms associated therewith. The group consists of algae, zoogleal and filamentous bacteria, attached protozoans, bryozoans and rotifers. The various types of periphyton include the epiphyton on aquatic macrophytes, the epilithon on rocks, the episammon on sand grains, the epixylon on wood and sometimes the epipelon on or in the mud.

Periphyton play a significant role in the functioning of aquatic ecosystems, producing significant standing crops and hence contribute much to the productivity of

freshwater ecosystems (Kaul *et al.*, 1980; Pandit, 1980, 84; Pandit *et al.*, 1985; Sarwar, 1999). Besides being a major contributor of carbon (energy) fixation, the periphytic algae form a major source of food for fish and waterfowl (Peters *et al.*, 1968; Denny *et al.*, 1978). The periphyton is, to some extent the life environment of invertebrates and also the commercial fish (Pandit *et al.*, 1985). The periphyton are useful as biological indicators of pollution as they are mostly sessile and hence cannot avoid contact with the waste effluents.

In view of the significant role which periphyton play in aquatic ecosystems, the present study was undertaken to assess the status of attached algae in Dagwan stream of Dachigam National Park in terms of species composition and abundance of the periphytic organisms.

METERIAL AND METHODS

The sampling was carried on monthly basis during day hours from June Nov 2004. Samples were collected by scraping 4cm^2 surface area of the stones using blade and brushes. The collected samples were preserved in 4% formalin and stored in small glass tubes and raised to a constant volume of 10ml. Identification 'under microscope' of algae up to generic level was carried out with the standard works of Edmondson (1959) and APHA (1998).

STUDY AREA

Dachigam National Park, one of the biodiversity rich natural habitats of the world, is situated between 34°5'- 34°10' N-latitude and 74°50'-75°10' E-longitude. The Dagwan stream and a host of other streams draining the bordering mountain slopes constitute the drainage network of Telbal Nallah. The stream takes its origin from the Lake Marsar (~ 3750 m) and the surrounding snow bound mountains feed it during summer. All along its course, the stream is joined by a number of tributaries of perennial and non-perennial origin.

For the present study, four different sampling sites were selected. Out of these, three sites were selected within the Dachigam premises and one at Telbal outside the official boundaries of the National Park (Fig. 1). The four sites lie in the decreasing altitudinal zones.

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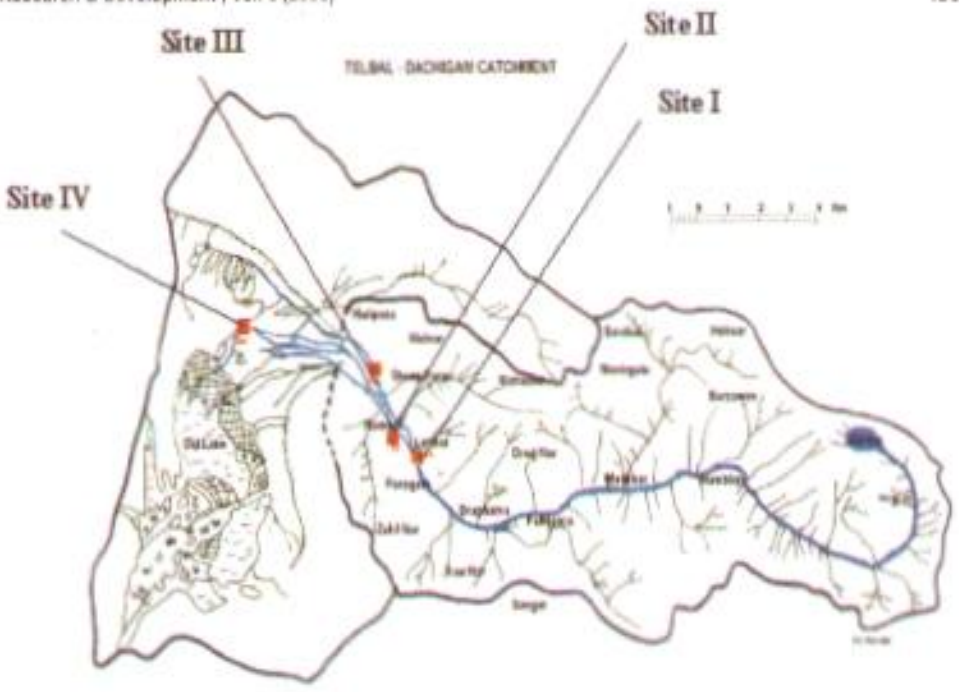

Fig. 1. Map showing study sites on Dagwan stream

RESULTS

Periphytic algal community of Dagwan Stream was represented by a total of 27 taxa which belonged to 4 major families namely Bacillariophyceae, Chlorophyceae, Cyanophyceae and Chryrsophyceae, with 9, 12, 5 and 1 taxa respectively. The study sites showed some variation in the composition as regards the number of taxa and the taxa common to all the four sites (Table 1). Thus the order of dominance recorded for the periphytic algae at different sites was:
Site II > I = III > IV.

Table 1. Periphytic algal composition of Dagwan stream at four different sites

	No. of taxa at different sites					
Algal Group	I	II	III	IV	Total No. of taxa	common to all sites
Bacillariophyceae	5	6	5	3	9	1
Chlorophyceae	6	8	7	2	12	2
Cyanophyceae	2	2	1	5	5	3
Chrysophyceae	-	-	-	1	1	-
Total	**13**	**16**	**13**	**11**	**27**	**6**

Though the species composition of periphytic algae did not exhibit significant variations yet large spatial and temporal variations were recorded in the population density patterns at different sites (Table 2 and 3). A comparison of the four study sites on the basis of mean monthly density (Fig. 2) reveals that Site I dominated with 1022 ind./cm^2, followed by Site IV with 989 ind./cm^2 which was followed by Site II with 929 ind./cm^2 and lastly by Site III with 796 ind./cm^2. The peaks and troughs of density do not correspond with the relative density and, therefore, the relative dominance of different groups showed differential patterns. However, Bacillariophyceae constituted the most dominant group at all the study sites.

Table 2. Mean population density (ind./cm^2) at the four sites.

	Study Sites			
Algal Taxa	**I**	**II**	**III**	**IV**
Amphora sp.	-	56	45	-
Calonies sp.	5	-	-	-
Cocconeis sp.	400	123	94	-
Cymbella sp.	-	45	40	-
Diatomella sp.	8	206	-	-
Fragillaria sp.	50	17	22	-
Gomphonema sp.	-	-	-	100
Navicula sp.	181	151	212	261
Nitzschia sp.	-	-	-	77
Actinastrum sp.	-	5	-	-
Chaetophora sp.	16	16	5	-
Chlorella sp.	28	22	16	100
Chlorococcum sp.	106	28	112	-
Closterium sp.	-	16	-	33
Cosmarium sp.	50	-	16	-
Hydrodictyon sp.	17	-	-	-
Mougetia sp.	-	-	11	-
Palmella sp.	-	28	-	-
Staurastrum sp.	-	11	-	-
Tetraspora sp.	-	-	17	-
Ulothrix sp.	72	38	139	-
Cocchloris sp.	39	-	67	45
Gleotricha sp.	-	-	-	33
Lyngbya sp.	50	106	-	145
Oscillatoria sp.	-	-	-	129
Rivularia sp.	-	61	-	61
Ceratium sp.	-	-	-	5

Table 3. Group-wise mean population density (ind./cm^2) at the four sites

Algal Groups	Collection Sites			
	I	II	III	IV
Bacillariophyceae	644	598	413	438
Chlorophyceae	289	164	316	133
Cyanophyceae 89	167	67	413	
Chrysophyceae	-	-	-	-
Total Periphytic Algae	**1022**	**929**	**796**	**989**

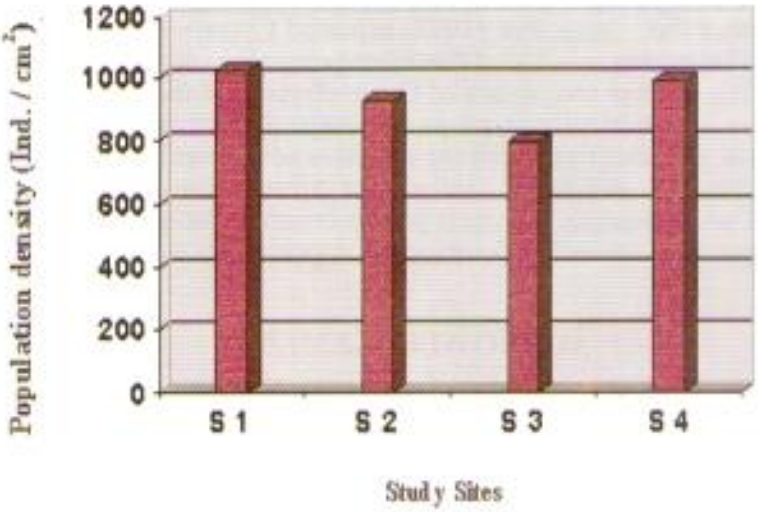

Fig. 2. Population density of periphytic algae in the Dagwan stream

DISCUSSION

The periphytic community at all the four sites of the Dagwan stream during the study period comprised of four groups with Bacillariophyceae predominating over the other three groups. The predominance of diatoms in the stream periphytic assemblages has also been reported by Chakrabraty *et al.* (1959) in River Jumna, Ray *et al.* (1966) in River Ganga and Jumna; Ratnasabapathy (1975) in the River Gombak, Aykulu (1978) in the River Avon and Lam (1979) in the River Waiktoo. The predominance of diatoms in cold waters has also been reported by Hickel (1973) according to whom the diatoms were mainly formed in cool season.

The growth and abundance of Chlorophyceae during the warm water periods and at the sites having high light intensity may be related to its excessive reproduction which is further corroborated by the earlier studies of Aykulu (1978). Kant and Kachroo (1980)

reported rise in temperature providing optimum conditions for the growth and reproduction of Chlorophyceae. The higher density of Chlorophyceae was recorded for the upstream sites (Site I, II and III), which indicates their unpolluted nature. Rai (1978) reported that Chlorophyceae flourished better at unpolluted stations.

Cyanophyceae showed its presence at all the four sites but with a well marked abundance at Site IV. The higher values of Cyanophyceae at this site seem to be related to the input of heavy doses of sewage and agricultural runoff (Bhat and Yousuf, 2002). This leads to an increase in the nutrient level, which is linked to low dissolved oxygen and pH and high dissolved organic matter. Higher levels of nutrients favour the growth of Cyanophyceae. The greater proportions of Cyanophyceae at Site IV indicate that the site is more polluted as compared to the other three sites. Rai (1978) reported Cyanophyceae numbers increasing with increasing pollution. He concluded that blue-green algae are more tolerant to pollution than green algae. The greater abundance of Cyanophyceae at this site may be attributed to their ability to live anaerobically, a property retained by this group since their initial evolution, which has provided them with the selective advantage in certain kinds of habitats. In the lower stretches, i.e. at Site IV (Telbal) the stream receives maximum sewage and agricultural runoff and domestic effluents which enhance the growth of Chrysophyceae. Thus Chrysophyceae represented by *Ceratium sp.* appears only at Site IV can act as pollution indicator species.

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