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LIMNOLOGICAL STUDY OF PRANTIJ BOKH, DIST: SABARKANTHA, GUJARAT

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ABSTRACT

Changes in water chemistry and algal composition of different sites of Prantij Bokh, which is an irrigation tank, are correlated in the present communication. Season wiseanalysis of water chemistry was carried out during different seasons and algal flora occurring during three seasons i.e. Monsoon, Winter and Summer were correlated with changes in water chemistry with changing season both water chemistry and algalcomposition also changed. Water samples of the Bokh were examined for various physico-chemical parameters as pH, Total Hardness, Chloride, Carbonates, Bicarbonates, Calcium and Magnesium Contents, Calcium and Magnesium Hardness,Alkalinity and Electric Conductivity (EC) etc. by standard international methods algae were identified by repeatedly making slides and Camera Lucida drawing were also made. Standard monographs were referred for confirming identification of algae.

Keywords: *Bokh water analysis, algal analysis, physico-chemical parameters and correlation between them of Prantij Bokh, Dist: Sabarkantha, Gujarat State.*

INTRODUCTION

Large surface of the earth covers water with an average depth of 3800 meters. 97% part of the totalwater of the earth abounds in ocean depressions. 2% part is frozen on poles as ice. Only 1% part of the earth surface covers with water as fresh water, Lakes and Rivers (Wetzel, 1983). Uses of wetlands are many e.g. Human dietary requirements, drinking water and ecological significance in terms of flood control and have habitats of fish, birds and wildlife.

The climate of the Gujarat state is different conditions across the state from North Gujarat to SouthGujarat i.e. extremely arid, semi-arid, and humid. An average annual rainfall across the state is aslow as 351mm in district of Kachchh and as high as 2000mm in Dangs. Maximum temperature is

39.9 ^{0}C up to 2nd week of May sometimes also extends and hotter months are May and June with 44 ^{0}C-45 ^{0}C, in arid and semi-arid region of North Gujarat Sabarkantha and Kachchh, Gujarat andminimum temperature is 12.5 ^{0}C in January.

STUDY AREA

Prantij Bokh is located between 70^0 50' to 72^0 52' E. latitude and longitude 23^0 20' to 23^0 29' N in **Sabarkantha** District in Gujarat state. The entire area belongs to Sabarkantha district. This areafalls in semi-arid zone, where the temperature is highest during the months of April and May till rain comes. The rainfall is erratic.

The Prantij Bokh is man made irrigation tank constructed before independence under British regime during 1912 A.D. This tank locally called as Bokh, is having 102.02 acre area with a depthof about 15-20 ft. Bokh is a seasonal lake and it totally dries up in pre-summer or summer. Bokh, however, possesses all the aspects of limnology thus the study was undertaken.

The important inlet of the Bokh is the Hathmati River. The main source of Bokh is rainfall. Watercomes in plain uplands and nalahs from surrounding uplands. Cultivation of *Trapa sp.* in the Bokhby local community, cloth washing and cattle etc. are causing Bokh water turbid. Peripheral surrounding land is wasteland, fallow land and wetland, where common trees like *Salvadora*, *Eucalyptus*, *Tamarindus* and *Prosopis* are occurring nearby. Wheat, Rice, Jowar and Bajara are main agriculture crops ultimately hereby, while Cotton, tobacco, Caster and Vegetables are cash crops of the area.

MATERIALS AND METHODS

After an initial reconnaissance survey certain points/sites were selected for periodical collection
i.e. S-1 to S-8 as shown the map. Here findings are only one site S-3 is reported. Water samples were collected from the S-3 every season after the water remained still and could bee accessible for sampling and they were grouped season wise for physico-chemical study. Macrophytes were also noted, algae and phytoplankton were collected and fixed in airtight plastic bottles containing4% formalin and then analyzed in the laboratory. Samplings were continued for three years 2001,2002 and 2003; here only of year 2001 data are presented. Water samples were collected and chemically analyzed using methods mentioned in APHA (1989). Season wise samples were collected and were clubbed as Summer, Monsoon and Winter of the year 2001 survey. For identification of algae, slides were prepared and observed under compound microscope. Micrometer and ocular eyepiece were used to study the size of algae and Camera Lucida have beendone most of the algal species and compared with the standard literature and monographs to confirm identification.

RESULTS AND DISCUSSION

Results or findings are described as under. Changes in water chemistry, algal composition correlated with changes in water chemistry and changes in algal composition and periodicity. The values of various parameters of the Bokh water of site S-3 during year 2001 are shown in Table-1 supported by graph. The ranges of physico-chemical parameters are pH- 8 to 9.5, Total Hardness- 114 mg/l to 150 mg/l, Calcium- 28.5 mg/l to 48.7 mg/l, Calcium Hardness- 6.2 mg/l to 11.8 mg/l, Chloride content- 49.6 mg/l to 85 mg/l, Alkalinity- 106 mg/l to 138 mg/l, Carbonate- 4.8 mg/l to 16.8 mg/l, Bicarbonate- 109.80 mg/l to 148.84 mg/l, Nitrate- 14 mg/l to 15 mg/l and Electric Conductivity (EC)- 0.125mho to 0.175mho. etc.
Season wise changes in physico-chemical parameters revealed that pH, Chloride, Alkalinity, Carbonate and Electric Conductivity (EC) show their peak value during Summer, which is supported by the observations of Shastree (1991), Gupta and Mehrotra (1986), Chloride as also have reported by Shrotriya and Dube (1990), Swati Oza (1996) and Ahluwalia (1999) in summer,Shastree *et al.* (1991) and Swati Oza (1996) however noted lower values of these findings, Carbonate and Electric Conductivity (EC) similar findings are in agreement with of those of SwatiOza (1996).
While Total Hardness, Magnesium Hardness and Nitrates contents show their lower value duringthe same season. Lower value of Total Hardness in summer was also reported by Shastree (1991),Gupta and Mehrotra (1986), however Kumar (1995a) reported higher values of the same, while findings on Nitrates are supported with those in Nalsarovar by Ahluwalia (1999).
Considering Monsoon season table-1 reveals that Total Hardness, Calcium, Calcium Hardness andNitrates show their peak/maximum values, in which Calcium and Calcium Hardness concentrations are contrary to the findings of Shastree *et al.* (1991) and Ahluwalia (1999), who have observed highest value of total hardness during Summer. The findings of Nitrates concentrations are in agreement with the observations of Ahluwalia(1999) in case of Nalsarovar.
Chloride, Alkalinity, Bicarbonate and Electric Conductivity (EC) show minimum values in same season, findings of Chloride in supported to observations of Swati Oza (1996), while Shastree *et al* (1991) reported the lowest value in March. Findings on Alkalinity and Bicarbonates supportedwith the findings of Ahluwalia (1999) and Marshall and Falconer (1973); Shastree *et al* (1991) andSwati Oza (1996) however found upper peaks of alkalinity during summer. Findings on Electric Conductivity (EC) were also reported by Swati Oza (1996), while Shastree *et al* (1991) reported lower value of EC in Winter.
During winter season concentrations of Magnesium Hardness and Bicarbonates contents were higher. Higher Magnesium Hardness was also reported by Shukla (1986), Sawati Oza (1996) andZafar (1964a, b); Ahluwalia (1999) however reported higher values of Magnesium Hardness during Summer and Shastree *et al* (1991) reported its higher value in Monsoon season.
pH, Calcium, Calcium Hardness, Carbonate and nitrates contents are lower in winter season; Gonzalves and Joshi (1946), who reported low pH of water during hot months in contrary to

present findings (April-May). Findings of Calcium content and Calcium Hardness are in agreementwith those of Shastree (1991), who reported lower values of Calcium content and Calcium Hardness in November, while Swati Oza (1996) reported the lower values of Calcium content andCalcium Hardness during Summer season. Findings however concentrations of Nitrates were alsoreported by Shastree *et al* (1991) and Ahluwalia (1999).

Algal changes depend on changes of physico-chemical parameters so that only 5 algal species occurred in Summer season due to extreme high climate conditions (temperature) and increasing mostly Diatoms in Monsoon with 13 species then 24 species of algae occurred in Winter season. The algal composition is shown in Table: 2

With arrival of Monsoon water filling the Bokh many algae which are dormant in Summer come up these are *Chroococcus minutes* (Kutz) Nag., *Chroococcus turgidus* Kuaty., *Oscillatoria curviceps* Ag. Ex, Gomont, *Aulosira laxa* Kirch, *Oedogonium paulense* Mont., *Tabellaria fenestrate* (Lyngb.) Kuetz., *Navicula rhyncocephala* Kuetz., *Navicula oblong* Kuetz., *Navicula radiosa* Kuetz., *Cocconeis pediculus* Her., *Caloneis sp.*, *Euglena convoluta* Karsch. and *Phacus curvicauda* Swir.

Maximum algal population was found to be in the winter season (November to January). Renu Sharma (1992) also observed maximum algal population in the winter season in Annasagar Lake at Ajmer.

The distribution of algae varies and can be correlated with the changes in the environment conditions, seasonal variation in the quality of water and relative adaptability from different species. Round (1979) remarked that the biotic and abiotic factors mainly, temperature and nutrients availability as also metabolic status of the species are also important features which, regulate and modify growth pattern of algal population, i.e., it is the natural interaction that determines the distribution of organisms both spatially and temporarily.

Oedogonium paulense Mont., *Tabellaria fenestrate* (Lyngb.) Kuetz., *Navicula oblong* Kuetz. and *Navicula radiosa* Kuetz. were survived throughout the year and seen to be adapted to any seasonalchanges in water chemistry and climate.

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