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Notes on Freshwater Diatoms from Sawai Madhopur-II, Rajasthan, India

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Abstract: ***The diatoms are major part of freshwater algae and major contributors of oxygen evolving organisms. Therefore, enlisting of diatoms not only contributed as data but also future hope for scientific community for further research. The research is carried out in Sawai madhopur of Rajasthan and found great diversity of this small group. The great diversity of diatoms is found in all aquatic habitats (stagnant as well as running).This is first attempt for enlisting diatoms from western part of Rajasthan. Eighteen diatoms species of two genus Fragillaria and Synendra have been described in present paper.***

Keywords: Algae, *Fragillaria*, *Synendra*, frustules

1. Introduction

The fresh water algae are found in all habitats with great diversity. Diatoms are part of photo-assimilate microalgae with vide diversity. The research project is carried out in the Sawaimadhopur district of Rajasthan. The district is situated in the western part of the Rajasthan and the rainfall is moderate. It cover area 5042.99.99 sq km and situated in between North longitudinal 25°-45' to 26°-41 and in between 75°-59' to 77°-0 East longitude. The temperature ranges from 4^{o} to 45^{o}c with average rainfall 873.40 mm. The district has rolling hills of Aravalli and Vindhyas ranges. The town founded in 1765 AD was named after its founder Sawai Madho Singh-I of Jaipur. Today Sawai Madhopur is known for Ranthambhor, a Wildlife reserve and a place of historical importance. In recent years a number of workers attempted to study the algae of different parts of Rajasthan, [16, 17] but the study of diatoms has been has been neglected aspect since long type.

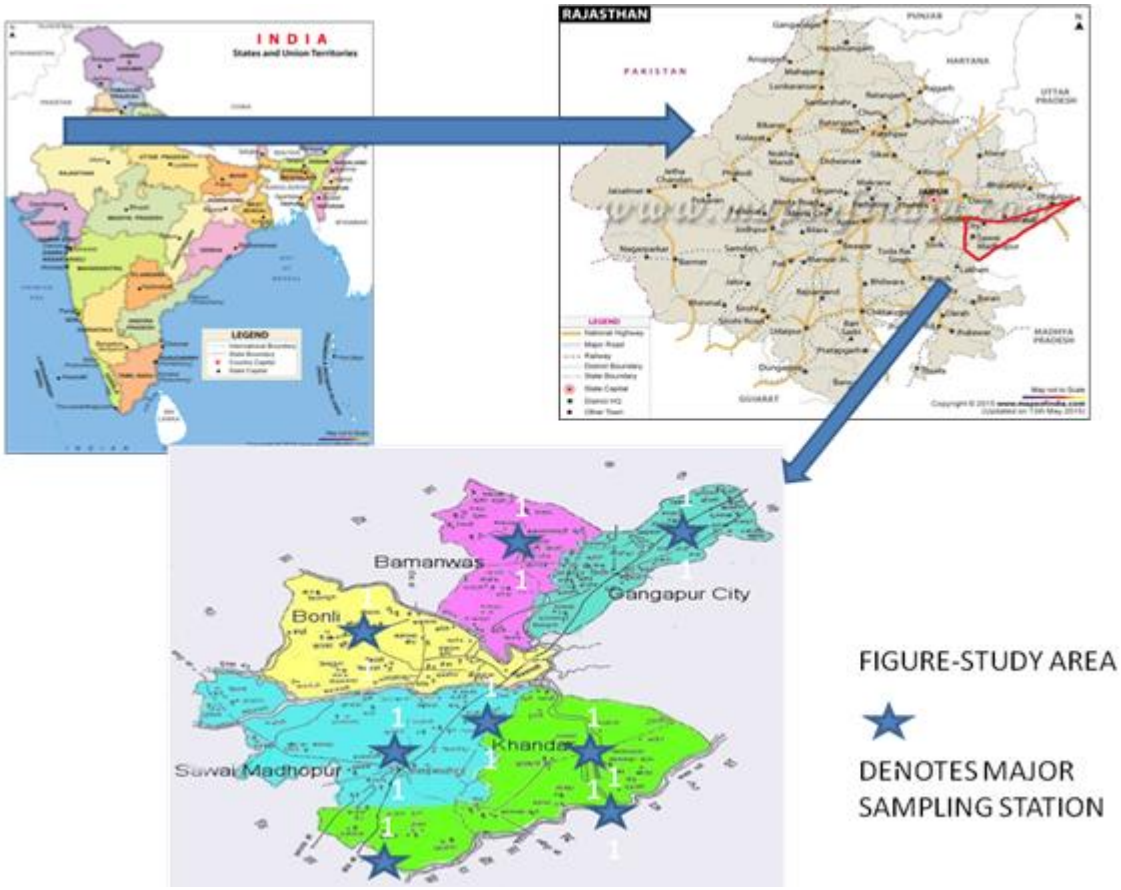
2. Materials and Methods

The samples were collected from various stations during 2015-2016 for the taxonomic enumeration of diatoms. At each stations the planktons was collected with no. 25 mesh plankton or directly with other objects by scraping of rocks, from aquatic submerged objects like plant twing and every site as well as possible. The various samples were oxidized by using concentrated HCl for five minutes and then repeatedly washing and decanted. Repeat it with concentrated H_2SO_4 and if oxidation was incomplete few drops of perchloric acid were employed to facilitate this process. Samples were repeatedly washing and decanted at each steps. Then samples was spread on slide and mount with high refractive index medium Nephrax for microscopic investigations. Cleaned frustules were examined for their morphological investigations.

The numbers of transapical raphe (Pennate diatoms) were counted from middle of the valve towards the apex. Much carefulness was taken during the drawing of scaled diagram by using camera Lucida.
Study area

3. Study Area

The study is carried out in the Sawaimadhopur district of Rajasthan. The district is situated in the western part of the Rajasthan and the rainfall is moderate. It cover area 5042.99.99 sq km and situated in between North longitudinal 25°-45' to 26°-41 and in between 75°-59' to 77°-0 East longitude. The temperature ranges from 4^{o} to 45^{o}c with average rainfall 873.40 mm. The district has rolling hills of Aravalli and Vindhyas ranges. Sawai Madhopur is known for Ranthambhor, a Wildlife reserve and a place of historical importance. The district is divided in to eight tehsils namely1. Sawai madhopur 2. Khandar, 3. Chauth ka Barwara 4. Gangapur City. 5. Bonli; 6. Bamanwas;7. Vazirpur; 8 Malarna Dungar. The area has many freshwater ponds, Dams and lakes. The perennial river Chambal in the Khandar tehsil is natural boundary between Rajasthan and Madhyapradesh. The samples were collected from all possible sites of sawai madhopur district as shown in figure.



Taxonomic enumerations

In present systematic diatoms taxa classification of Hustedt, 1930, 1930-1962, has as far as possible been used. The halobian and pH spectra are as per works of Neils Foged (N.F.), Boye Petersen (B.P.), Max Muller (M.M.), Ruth Patrick (R.P.) and Nygaard. The pH relation divided in to three categories acidophilous (5.5-6.5) circumneutral (6.5-7.5), and Alkaliphilous (7.6-8.9). The identification was done by works of Neils Foged (1959, 64, 66, 71, 73, 75, 77, 78, 79), Sreenivasan and Duthie (1973), Hendey (1964), Gandhi (1959, 61, 62, 67.). In present abbreviations were used as below Hust. for Hustedt, Parag for H.&M. Perallago (1897-1908), AS for A. Schmidt's Atlas (1874-1959). Foged for Neils Foged. Ab. For Average. L-Lengh;W-width; S-longitudinal striae; Sr. radial striae;Pl- Plate; F-figure or figures; P^H-I = Acidophilous; P^H-II= Circumneutral;P^H-III=Alkaliphilous; P^H-IV= not recorded;

4. Result and Discussions

The halobian and pH spectra are as per works of Neils Foged (N.F.), Boye Petersen (B.P.), Max Muller (M.M.), Ruth Patrick (R.P.) and Nygaard. The pH relation divided in to three categories acidophilous (5.5-6.5) circumneutral (6.5-7.5), and Alkaliphilous (7.6-8.9). The identification was done by works of Neils Foged (1959, 64, 66, 71, 73, 75, 77, 78, 79), Sreenivasan and Duthie (1973), Hendey (1964), Gandhi (1959, 61, 62, 67.) M.D. Guiry 2017. In present abbreviations were used as below Hust. for Hustedt, Parag for H.&M. Perallago (1897-1908), AS for A. Schmidt's Atlas (1874-1959). Foged for Neils Foged. Ab. For Average. L-Lengh;W-width; S- longitudinal striae; Sr. radial striae; F-figure or figures; P^H-I = Acidophilous; P^H-II= Circumneutral;P^H-III=Alkaliphilous; P^H-IV= not recorded

Fragilaria brevistriata Grun. (Hust. 1930-66, II, p. 168, fig. 676 a-e. AS 307 : 10-14)
L. 14.0-18.0; W. 3.0; S. 11-12; **F .7, 8;** P^H –III

Oligohalobolous (indifferent). Alkaliphilous. Cosmopolitan.
Fragilaria capucina Desmaz. (Desmaziers, 1825, No. 453; Kützing, 1844, p. 45, pl. 16, fig. 3; Wm Smith, 1856 p. 22, pl. 35, fig. 296. Hust. 1930-66, II, p. 144, fig. 659 a-e. AS 298 : 14, 17-22, 29, 30. Foged 1978, p. 62)
L. 25.0-75.0; W. 3.0-4.0; **F .1,9,** P^H –III

Oligohalobolous (indifferent). Alkaliphilons. Cosmopolitan.
Fragilaria capucina var. *gracilis* (Str.) A. Cleve (A. Cleve, in K.V.A. Handl. 4:1, p. 46, fig. 3571 m.)
L. 65.0; W. 5.0; **F. 2;** P^H –III

Fragilaria construens var. *ventar* (Ehr.) Grun. (Hust. 1930-66, II, p. 158, fig. 670 h-m. AS 296: 30-33, 47. Foged 1978, p. 63)
L. 5.0-6.0; W. 2.0-2.5; **F .3**; P^H –III.

Oligohalobolous (indifferent). Alkaliphilous. Cosmopolitan.

Fragilaria crotonensis kitton. (Hust. 1930-66, II, p. 143, fig. 658. AS 299 : 1-8. Foged 1978, p. 63)
L. 90.0; W. 5.0; S. 14-15; **F .10**; P^H –III.

Oligohalobolous (indifferent). Alkaliphilous. Cosmopolitan.

Fragilaria intermedia Grun. (Hust. 1930-66, II, p. 152, fig. 666. AS 297 : 42-46. Foged 1978, p. 63; 8: 2, 3)
L. 20.0-65.0; W.3.0- 5.0; S. 8-13; **F .11**; P^H –III

Oligohalobolous (indifferent). Alkaliphilous. Cosmopolitan.

Fragilaria pinnata Ehr. (Hust. 1930-66. II, p. 160, fig. 674 a-i. AS 297 : 47-50, 52-58, 65-72; 298 : 47-74, Foged 1978, p. 64; 8:7).
L. 4.0-6.0; W. 2.0; **F .4, 5**; P^H –III.

Oligohalobolous (indifferent); Alkaliphilous (N.F.). Cosmopolitan.
Fragilaria ungeriana Grun. (AS 298 : 1-8. Foged 1978, p. 64; 8 : 8-10)
L. 40.0-65.0; W.5.0- 8.0; S. 10; **F .12-13**; P^H –III

Halophilous, Alkaliphilous, recorded from Africa, Australia, India.
Fragilaria vaucheriae (Kütz.) Peterson. (J. B. Peterson 1938, p. 167, fig.1. Foged 1978, p. 64; 8 : 5)
L. 10.0-25.0; W.4.0- 5.0; S. 13-15; **F .14,15**; P^H –III

Oligohalobolous (indifferent). Alkaliphilous. Cosmopolitan.
Fragilaria virescens Ralfs. (Hust 1930, 66, p. 162, fig. 672 a, b. AS 297 : 3-6, 8-12, 20-33, Foged 1978, p. 64; 8:4)
L.13.0-18.0; W. 4.0-8.0; **F .6**; P^H –II ;Halophobous . pH - circumneutral. Cosmopolitan.

Synedra acus Kütz.(Van Heurck, 1899, p. 311, pl. 10, fig. 420. Boyer, 1926, p. 201; Hust. 1930-66, II P. 206, fig. 693a. 170; Krishnamurthy, 1954, p. 337, fig. 7. AS 303:7. Foged 1978, P. 130)
L. 90.0-105.0; W.4.0-7.0; S. 15; **F. 16**; pH –III

Oligohalobolous (Indifferent). Alkaliphilous. Cosmopolitan.
Synedra acus var. *radians* (Kütz.) Hust. (Hustedt, in Pascher p. 155, fig. 171)
L. 90.0-110.0; W.4.0- 5.0; **F .17**; P^H –III . pH Alkaliphilous.

Synedra delicatissima var. *angustissima* Grun.
(Hustedt. in Pascher, p. 155, fig. 172.)
L. 90.0-150.0; W.3.0-4.0; **F .18**; P^H –III ,Halobolous. Indifferent (B.P.), Alkaliphilous.

Synedra parasitica (W. Smith) Hust. (Hust. 1930-66, II, p. 204, fig. 695, a, b. Foged 1978, p. 131; 8 : 16, 17; 9. 11-13)
L. 12.0-18.0; W.4.0- 6.0; S. 14-15; **F .19, 22;** P^H –III
Oligohalobolous (indifferent). Alkaliphilous. Cosmopolitan.

Synedra rupens Kütz. (Hust. 1930-66, II, p. 207, fig 697 a, b. Foged 176, p. 52; 2 : 2, 3. 1978, p. 132)
L. 25.0-32.0; W.3.0; S. 14-16; **F .23**; P^H –III.
Oligohalobolous (indifferent). pH - circumentral. Cosmopolitan

Synedra tabulata var. *fasciculata* (Kütz.) Grun. (Hust. 1930-66, II, p. 218 figs. 710 i-l. AS 304 : 17-48. Foged p. 132; 8:18, 20)
L. 20.0-29.0; W.3.0-5.0; **F .20**; P^H –III ,Halophilous, Alkaliphilous. Cosmopolitan.

Synedra tabulata (Ag.) Kütz. (Kützing, 1844, p. 68, pl. 15, fig. 6; Wm Smith, 1853, p. 73, pl. 12, fig. 97; Boyer, 1927, p. 205; Hendey, 1951, p. 35; Hust 1930-66, II. AS 304: 6-12. Foged 1978, p. 132; 9: 5) Syn. *Diatoma tabulatum* Agardh 1830-32, p. 50 (1832)
L. 80.0-85.0; W.4.0-5.0; S. 9-10; **F .24**; P^H –IV.

Mesohalobolous. Euryhaline. (N. F.) Cosmopolitan
Synedra ulna (Nitzsch) Ehr. (Hust. 1930-66, II, p. 195, 691A a-c. As 301 : 1-26; 312 : 1-17, 19-22; 303 : 1-4, Foged 1978, p. 133; 8 : 11, 12)
L. 110.0-140.0; W.6.0- 8.0; S. 13-14; **F .21**; P^H –III.

Cosmopolitan. Oligohalobolous. (Indifferent). pH - Circumneutral.

The *Fragillria* species are found very common in study area and many valves are joining to each other to form large yellowish mats in stagnant water bodies while *Synendra* species valve are usually found separately. The *Fragillaria* and *Syndra* species are also indicate less polluted water bodies. In the month of Sept-Octomber *Fragillaria* is dominant diatoms in stagnant freshwater bodies.

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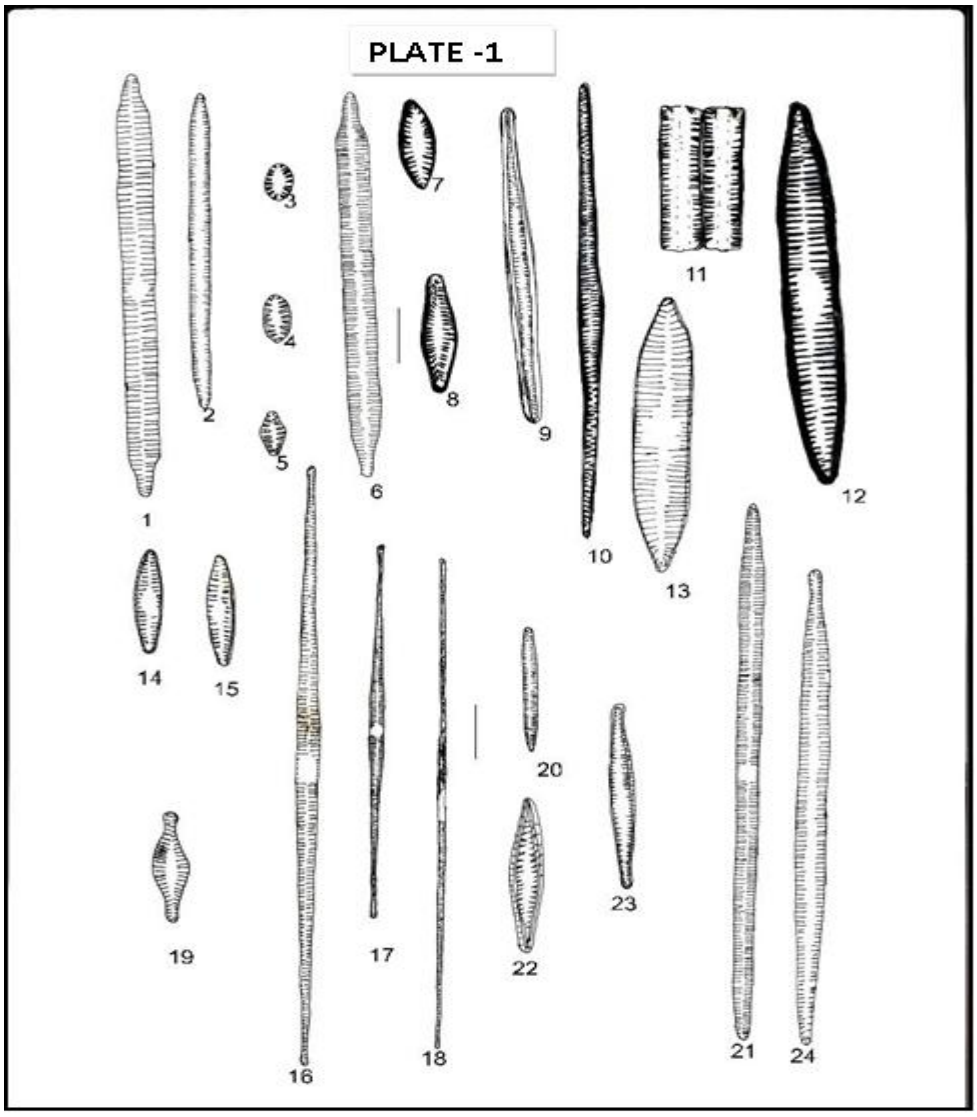

Legends of plate

1) *Fragilaria capucina* Desm.
2) *Fragilaria capucina* var. *gracilis* (Østr.) A.Cleve
3) *Fragilaria construens* var. *ventar* (Ehr.) Grun.
4) *Fragilaria pinnata* Ehr.
5) *Fragilaria pinnata* Her
6) *Fragilaria virescens* Ralfs
7) *Fragilaria brevistriata* Grun.
8) *Fragilaria brevistriata* Grun.
9) *Fragilaria capucina* Desmaz.
10) *Fragilaria crotonensis* Kitton.
11) *Fragilaria intermedia* Grun.
12) *Fragilaria ungeriana* Grun.
13) *Fragilaria ungeriana* Grun.
14) *Fragilaria vaucheriae* (Kütz) Petersen
15) *Fragilaria vaucheriae* (Kütz) Petersen
16) *Synedra acus* Kütz
17) *Synedra acus* var. *radians* (Kütz) Hust.
18) *Synedra delicatissima* var. *angustissima* Grun.
19) *Synedra parasitica* (W. Smith) Hust.
20) *Synedra tabulata* var. *fasciculata* (Kütz) Grun.
21) *Synedra ulna* (Nitzsch) Ehr.
22) *Synedra parasitica* (W. Smith) Hust.
23) *Synedra rupens* Kütz
24) *Synedra tabulata* (Ag.) Kütz

Scale denotes to 10 µm

Table 1: Comparative characteristics of identified diatoms

S.No.	Name of diatom species	Length µm	Width µm	Number of Striae per 10 µm	pH range	Distribution	Figure no.
1	*Fragilaria brevistriata*	14-18	5	11-12	III	cosmopolitan	7,8
2	*Fragilaria capucina* Desm	25-75	3-4		III	cosmopolitan	1,9
3	*Fragilaria capucina* var. *gracilis* (Østr.) A.Cleve	65	5		III	cosmopolitan	2
4	*Fragilaria construens* var. *ventar* (Ehr.) Grun.	11-14	7-9.5		III	cosmopolitan	3
5	*Fragilaria pinnata* Ehr.	7-14	4		III	cosmopolitan	4,5
6	*Fragilaria virescens* Ralfs	13-18	4-8		II	cosmopolitan	6
7	*Fragilaria crotonensis* Kitton.	90	5	14-15	III	cosmopolitan	10
8	*Fragilaria intermedia* Grun.	20-65	3-5	8-13	II	cosmopolitan	11
9	*Fragilaria ungeriana* Grun.	40-65	5-8	10	III	Africa, Australia, India	12-13
10	*Fragilaria vaucheriae* (Kütz) Petersen	10-25	4-5	13-15	III	cosmopolitan	14-15
11	*Synedra acus* Kütz	90-105	4-7	15	III	cosmopolitan	16
12	*Synedra acus* var. *radians* (Kütz) Hust.	90-110	4-5		III	cosmopolitan	17
13	*Synedra delicatissima* var. *angustissima* Grun.	90-150	3-4		III	cosmopolitan	18
14	*Synedra parasitica* (W. Smith) Hust.	12-18	4-6	14-15	III	cosmopolitan	19,22
15	*Synedra tabulata* var. *fasciculata* (Kütz) Grun.	20-90	3-5		III	cosmopolitan	20
16	*Synedra ulna* (Nitzsch) Ehr.	110-140	6-8	13-14	III	cosmopolitan	21
17	*Synedra rupens* Kütz	25-32	3	14-16	III	cosmopolitan	23
18	*Synedra tabulata* (Ag.) Kütz	80-85	4-5	9-10	IV	cosmopolitan	24

Author Profile

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