TAXONOMIC STUDIES ON *Nitzschia* (Bacillariophyta) FROM KASUR AND LAHORE DISTRICTS OF PAKISTAN

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**Abstract:** Specimens of algal genus *Nitzschia* Hassall (Nitzschiaeaceae, Bacillariales, Bacillariophyceae, Bacillariophyta) were collected from different freshwater habitats at Kasur and Lahore districts of the Punjab Province of Pakistan during May 2004 and January 2005. Nine species of the diatom were taxonomically determined and have been described for the first time from these areas.

**Keywords:** Algae, diatoms, Bacillariophyta, *Nitzschia*, taxonomy, freshwater

**Introduction**

After synoptical taxonomic study of Bacillariophyta from Peshawar Valley of Pakistan [1], several species of diatoms have been described from various areas of N. W. F. P., Punjab and Azad Kashmir [2-12]. A few species of freshwater diatoms have also been reported from Sindh Province [13-22]. However no detailed taxonomic investigation has yet been made on diatoms from any area of the country. During the recent research program, which was started in March 2003 [23], a large collection of diatoms was made from freshwater habitats of various districts of the Punjab, certain areas of N. W. F. P. and Azad Kashmir. As a result of that some species of *Cymbella* C. A. Agardh and *Navicula* Bory de Saint-Vincent, were taxonomically described [24,25]. In the present study, taxonomic descriptions of nine species of *Nitzschia* Hassall (Nitzschiaeaceae, Bacillariales, Bacillariophyceae, Bacillariophyta; according to the recently proposed classification [26]) have been presented.

**Materials and Methods**

The specimens were picked using a dropper from the samples collected at various freshwater habitats (lakes, streams, stagnant water ponds, submerged stones) of Kasur and Lahore districts of the Punjab Province of Pakistan during May 2004 and January 2005. They were carefully washed, preserved in plastic bottles containing 3% formalin and taxonomically investigated according to the techniques as described earlier [24,25]. The diatom species were placed in 10% glycerin mounts and studied under a Zeiss (Germany) stereoscope. Identification of the specimens down to species level was carried out with the help of authentic literature [1, 27-30]. Drawings were made with the help of camera lucida. Most of the specimens were collected in vegetative condition and hence no information could be recorded on sexual reproduction. The voucher specimens are kept in the Phycology & Phycochemistry Lab. (Room No. 18), MAH Qadri Biological Research Centre, University of Karachi, where this study was carried out.

**Results and Discussion**

Nine species of *Nitzschia* Hassall were identified. They were taxonomically described...
for the first time from the areas of collection in Pakistan. Their taxonomic enumerations are as follows.

_Nitzschia_ Hassall 1845: 435, nom. cons.

Frustules solitary and free floating; girdle straight, elongate or sigmoid with truncate ends; valve straight, linear or elliptical, attenuated to acute or subobtuse ends; carinal dot conspicuously present; striae transverse, punctate, coarse or fine; chromatophores one or two, elongated with regular margins. Its following species have been obtained from the collected samples which may be distinguished as follows (numbers in parenthesis below refer to the species shown in Fig. 1).

1. Valve minute ..................... _N. subtilis_ (8)
   Valve otherwise........................................ 2
2. Frustules up to 300 µm long _N. obtusa_ (5)
   Frustules less than 300 µm long .................. 3
3. Valve up to 9 µm broad ......................... 4
   Valve more than 9 µm broad ...................... 5
4. Frustules up to 170 µm long
   ...................................................... _N. vermicularis_ (9)
   Frustules less than 170 µm long ............. 6
5. Valve lanceolate .................... _N. angustata_ (1)
   Valve otherwise.......................................................... 7
6. Frustules up to 78 µm long ... _N. regula_ (7)
   Frustules less than 78 µm long ............ 8
7. Ends of valve rounded ...... _N. punctata_ (6)
   Ends of valve slightly attenuated to obtuse
   ...................................................... _N. communis_ (2)
8. Valve up to 29 µm long .. _N. frustulum_ (3)
   Valve up to 70 µm long ...... _N. linearis_ (4)


General characters
Valve linear, lanceolate, swollen centrally towards the keel side, ends blunt; keel marginal, carinal dots continued into striae; striae lineate, parallel; cell length 65-105 µm and breadth 8-12 µm; striae 5-9 within 10 µm; chromatophores one or two, elongated with irregular margins (Fig. 1).


Geographical distribution: Afghanistan, Tibet, Poland, Faerøes (Denmark).

Remarks: The specimens were collected from fountain of Shalimar Garden at Lahore during summer. The material was obtained in vegetative form.


General characters
Frustules linear, slightly attenuated at obtuse ends; valve elliptical, lanceolate, attenuated towards obtuse ends; keel punctate; striae more than 30 within 10 µm; cell length 35-38 µm and breadth 7-10 µm; chromatophores one or two, elongated with irregular margins (Fig. 1).


Remarks: The material was obtained from paddy fields between Mureedke and Narang Mundi during autumn. The specimens were collected in vegetative form only, hence sexual reproduction could not be observed.

frustulum Kützing 1844.

**General characters**

Valves 22-29 µm in length and 5-9 µm in breadth; chromatophores one or two (Fig. 1).

**Geographical distribution:** Afghanistan, Japan, Libya, Poland, Faeröes (Denmark).

**Remarks:** The specimens were collected from village of Jhulkey during winter. Sexual reproduction was not observed, and the material was obtained in vegetative form only.


**General characters**

Valve straight, linear; ends slightly acuminate; striae obscure; cell length 66-70 µm and breadth 7-8 µm; chromatophores one or two (Fig. 1).

**Locality:** Lahore District: Mahmood Booti (2-1-2005).

**Geographical distribution:** Pakistan: Peshawar, Lahore; Libya, Poland.

**Remarks:** The specimens were obtained from pools near Mahmood Booti. The material was collected in vegetative form, hence sexual reproduction was not observed in them.

5. *N. obtusa* W. Smith 1853: 39, **References:** [28: 531, 30: 86].

**General characters**

Frustrules sigmoid, rounded at the end; keel somewhat excentric, inflexed in the middle; the two medium puncta distinct, keel puncta 5-6 within 10 µm; striae 26 within 10 µm; cell length 300 µm; chromatophores one or two (Fig. 1).

**Locality:** Lahore District: Minar-e-Pakistan (10-5-2004).

**Geographical distribution:** United States, Libya, Poland.

**Remarks:** The material was collected from the fountain of Minar-e-Pakistan at Lahore during summer. Sexual reproduction was not observed, and the specimens were obtained in vegetative form only.


**General characters**

Valve linear, elliptical, rounded at the ends; striae transverse, parallel, punctate; cell length 69-71 µm and breadth 11 µm; chromatophores one or two (Fig. 1).

**Locality:** Lahore District: Mahmood Booti (3-10-2004).

**Geographical distribution:** Pakistan, Poland.

**Remarks:** The specimens were obtained from pools near Mahmood Booti during autumn. The material was collected in vegetative form, but sexual reproduction was not observed in them.

7. *N. regula* Hustedt 1922

**General characters**

Valve length 70-78 µm and breadth 7-9 µm; chromatophores one or two (Fig. 1).

**Locality:** Kasur District: Jhulkey Village (22-12-2004).

**Geographical distribution:** Afghanistan, Europe.
**Remarks:** The material was collected from the village of Jhulkey at Kasur during winter. Sexual reproduction could not be observed in the specimens, which were collected in vegetative form only.


**General characters**

Valve minute, linear, lanceolate; keel present; striae obscure or absent; chromatophores one or two (Fig. 1).

**Locality:** Kasur District: Kasur (22-12-2004).

**Geographical distribution:** India, Pakistan, Poland.

**Remarks:** The material was obtained from roadside puddles of Kasur during winter. The specimens were collected in vegetative form, hence sexual reproduction was not observed in them.


**General characters**

Frustules solitary; girdle sigmoid with truncate ends; valve sigmoid, linear, slightly attenuated towards the end; keel punctate; cell length 90-170 µm and breadth 6-9 µm; chromatophores one or two (Fig. 1).

**Locality:** Lahore District: Shalimar Garden (29-7-2004).

**Geographical distribution:** Pakistan: Peshawar; Libya, Poland, Faeröes (Denmark).

**Remarks:** The specimens were collected from the fountain of Shalimar Garden at Lahore during summer. Sexual reproduction could not be observed. The material was obtained in vegetative form only.

**Fig. 1.** Species of *Nitzschia* from Pakistan. (1) *N. angustata*, (2) *N. communis*, (3) *N. frustulum*, (4) *N. linearis*, (5) *N. obtusa*, (6) *N. punctata*, (7) *N. regula*, (8) *N. subtilis* and (9) *N. vermicularis*.

**References**


