A checklist of blue-green algae (Cyanobacteria) from Punjab, India

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Abstract: A checklist of Cyanobacteria (Blue-green algae) has been made by reviewing available literature in order to contribute to the knowledge of biodiversity of algae in the Punjab state of India. The list records 317 taxa of the phylum Cyanobacteria distributed among 74 genera, 32 families, and six orders. The order Oscillatoriales has 115 taxa, followed by Nostocales (84), Synechococcales (60), Chroococcales (49), Spirulinales (8), and Pleurocapsales (1). The family Nostocaceae has the maximum number of genera followed by Microcoleaceae, Chroococcaceae, Oscillatoriaceae and other reported families. The genera with the highest number of species were Phormidium (39 species), Lyngbya (15 species), Oscillatoria (14 species), and Leptolyngbya & Scytomena (13 species each). The checklist revealed a high degree of species richness within phylum Cyanobacteria found in Punjab. This checklist can provide a baseline for future floristic studies with taxonomically updated/accepted name of genera/species of cyanobacteria.

Keywords: Algae, biogeography, cyanophyceae, diversity, documentation, inventory, taxonomy.

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INTRODUCTION

Cyanobacteria, also known as Blue-green algae, are oxygenic photosynthetic prokaryotes belonging to the class Cyanophyceae. It has been estimated that these organisms originated nearly 3.5–3.8 billion years ago at the beginning of Archean era (Schopf 2002; Blank & Sanchez-Baracaldo 2010; Sleep 2010). Cyanobacteria occur in diverse range of aquatic and terrestrial habitats including extreme environments (Whitton & Potts 2000; Singh et al. 2014, 2018; Kimambo et al. 2019). They show high degree of phenotypic variation when compared to other prokaryotic organisms (Dvořák et al. 2017). Traditionally these organisms have been identified and categorized mainly using morphological features such as dimension, shape of vegetative and perennation stage, colour & characteristics of sheath, branching pattern, and cell contents (Komárek & Anagnostidis 1998, 2005; Komárek 2013). Presently, the advancement and use of modern taxonomic tools including ultrastructural studies, 16S rRNA gene, 16S-23S rRNA ITS region and cpcB-cpcA IGS region of phycocyanin locus has lead to the changes in taxonomic position of various cyanobacterial genera/species (Komárek 2014). The ability of cyanobacteria to release exopolysaccharides and fix atmospheric nitrogen is pertinent in maintaining a healthy condition of the soil; additionally, this ability can further assist with the reclamation of barren land (Singh et al. 2016). In recent years, cyanobacterial research has gained greater academic interest as many species in this phylum have been identified to be a potential source of various value-added products such as biofertilizers, biofuels, and bioactive compounds. Cyanobacteria is also an attractive laboratory model that is used for genetic studies to understand their adaptation to extreme conditions and climatic changes. (Abed et al. 2008; Al-Ha 2016; Singh et al. 2017; Kumar et al. 2019).

Cyanobacteria have been reported from various habitats in Punjab including wetlands, paddy fields and polluted water etc. (Vasishta 1960a, 1961, 1962a,b, 1963; Pandhol 1974; Grover & Pandhol 1975; Mehta 1975; Sarma et al. 1979; Dhingra 2006; Singh et al. 2009; Khattar et al. 2015). Despite an increase in research effort, knowledge regarding the diversity and distribution of cyanobacteria in Punjab is still inconsistent. Thus there is need for an updated species checklist in order to contribute to the current knowledge of cyanobacterial diversity of the state. Although, in Gupta (2012) published a checklist of cyanobacteria from India in which 218 cyanobacterial taxa were reported from Punjab, the present study adds 99 taxa to this list, hence increasing the total to 317 taxa. Since cyanobacteria are an important component of the aquatic ecosystem, cyanobacterial wealth of the state should be known so that these can be collected and cultured for future studies.

The objective of this work was to revise and organize all available existing taxonomic data for cyanobacteria of recent taxonomic revisions in the state of Punjab. The checklist could serve as a baseline for future diversity, limnological, environmental impact assessment, bio-geographic distribution and speciation studies. Creation of a checklist is the most basic taxonomic work on a group of organisms arranged in systematic or alphabetical order. The checklist prepared during present work is done in a systematic order by reviewing the available literature up to September 2020. This is the first complete checklist of cyanobacteria from Punjab covering all currently accepted species names and their synonyms.

MATERIALS AND METHODS

This checklist has been prepared by consulting available literature including research papers and dissertations (PhD/ M.Phil/ MSc.). Data were compiled by reviewing diversity, taxonomy and ecological studies containing lists of cyanobacteria identified up to species level. Geographically, Punjab is situated in the north of the country between 29.30–32.32 °N and 73.55–76.50 °E (Figure 1). The climate of Punjab is continental, semiarid to sub-humid, it experiences both extreme summer and winter with annual rainfall of 58–96 cm (Gosal 2004; Krishan et al. 2015). The texture of soil in Punjab varies from coarse to fine sand, silt, and loam (Dhingra 2006). Cyanobacterial species recorded in this checklist were identified by various workers from the year 1936 to 2020. In this checklist species were arranged taxonomically by following the classification system recommended by Komárek (2014). Additionally, the taxonomic position, authorities and the currently accepted name was verified from AlgaeBase website (Guiry & Guiry 2020).

RESULTS AND DISCUSSION

This compiled checklist revealed that cyanobacterial diversity within Punjab is represented by 317 taxa (297 species, 13 varieties, and 7 forms) belonging to 74 genera and five orders (i.e., Chroococcales,
Synechococcales, Spirulinales, Oscillatoriales, and Nostocales) of Class Cyanophyceae (Table 1). On the basis of number of species, order Oscillatoriales (36%) is found to be the most diverse followed by Nostocales (27%), Synechococcales (19%), Chroococcales (15%), and Spirulinales (3%) (Figure 2). Among the genera, genus *Phormidium* had the maximum number of species, i.e., 39 followed by *Lyngbya* with 15 species, *Oscillatoria* with 14 species, *Leptolyngbya* and *Scytonema* with 13 species each. The families with the highest number of taxa were Oscillatoriaceae (72), Nostocaceae (51), Microcoleaceae (30), Microcystaceae (22) and Merismopediaceae (16). Vasishta (1960d, 1961, 1963b) reported 117 cyanobacterial taxa from Hoshiarpur district of Punjab. Grover and Pandhol (1974) reported 62 cyanobacterial species from paddy fields of Punjab. Sarma et al. (1979) identified 67 cyanobacterial species from varied localities in Patiala district of Punjab. Extensive floristic work performed by Dhingra (2006) on blue-green algae reported 158 species from moist soils, wetlands, ponds, roadside puddles, bricked and cemented surfaces from various localities of Punjab. Singh et al. (2009) studied cyanobacterial diversity from the rice fields of Patiala district and reported 25 cyanobacterial species from the study area.

The taxonomic identity of 87 cyanobacterial taxa previously reported from Punjab on their morphology has been revised with the help of modern taxonomic tools (marked with ‘*’ in Table 1). Current accepted names of such taxa were updated following Algaebase. Taxonomic revision is continuous leading to the revision of taxonomic status as well as the nomenclature of the organism. Application of modern ecological, ultra-structural and molecular methods, aided by the cultivation of numerous cyanobacterial morphotypes, has substantially changed our knowledge of these organisms (Komárek 2006). Modern taxonomic tools have also enabled major advances in cyanobacterial taxonomy and aided with the criteria used for their phylogenetic classification (Komárek 2006, 2014). Cyanobacteria recorded from Punjab inhabit varied habitats from planktonic to terrestrial and epilithic to epiphytic. Observations made from the present checklist note that the number of cyanobacterial species growing on terrestrial habitats (110) were greater than planktonic (84), epilithic (26), and epiphytic (15) (Table 1). However,
78 cyanobacterial species were reported from more than one habitat (Table 1, Figure 3). They colonize large portions of the available terrestrial habitats due to its ability of ‘anhydrobiosis’ (Billi & Potts 2002; Alpert 2005). Moreover, they have a wide distribution range due to their unimaginable adaptive capacities (Gaysina 2019).

In conclusion, as a first complete and updated checklist of cyanobacteria from Punjab this will provide a baseline data for future floristic study. The explored and poorly explored regions of Punjab in terms of number of cyanobacterial taxa are highlighted in Figure 1. We can also assume that future studies of cyanobacterial diversity from poorly explored regions will increase the number of species by exploring more unexplored habitats of Punjab.

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| Taxonomic Assignment | Planktonic | Terrestrial | Epilithic | Epiphytic/Endophytic | References |
|----------------------|------------|-------------|-----------|----------------------|------------|
| **Class: Cyanophyceae** |            |             |           |                      |            |
| **Subclass: Synechococaphycidae** |            |             |           |                      |            |
| **Order: Synechococcales** |            |             |           |                      |            |
| **Family: Synechococcaceae** |            |             |           |                      |            |
| 1. Anathece clathrata (West & G.S.West) Komárek, Kastovsky & Ježberová | +            | -           | -          | -                    | 16         |
| 2. Aphanothece clathrata West & G.S.West | +            | -           | -          | -                    | 16         |
| 3. Synechococcus elongatus (Nägeli) Nägeli | +            | +           | -          | -                    | 16, 20     |
| **Family Merismopediaceae** |            |             |           |                      |            |
| 4. Aphanocapsa biformis A.Braun | +            | -           | -          | -                    | 7          |
| 5. Aphanocapsa delicatissima West & G.S.West | -            | +           | -          | -                    | 12         |
| 6. Aphanocapsa elachista West & G.S.West | -            | +           | -          | -                    | 12         |
| 7. Aphanocapsa grevillei (Berkeley) Rabenhorst | +            | -           | -          | -                    | 16         |
| 8. Aphanocapsa koordersi K.M.Strøm | +            | -           | -          | -                    | 16         |
| 9. Aphanocapsa muscicola (Meneghini) Wille | +            | +           | +          | -                    | 1, 7, 12   |
| 10. Aphanocapsa roseana De Bary | -            | +           | -          | -                    | 12         |
| 11. Aphanocapsa stagonalis (Lemmernann) R.N.Beljakova | +            | -           | -          | -                    | 12, 16     |
| 12. Limnococcus limneticus (Lemmernann) Komárek, Jezberová, O.Komárek & Zapomelová | +            | -           | -          | -                    | 10         |
| 13. Merismopedia elegans A. Braun ex Kützing | +            | -           | -          | -                    | 16, 25     |
| 14. Merismopedia glauca (Ehrenberg) Kützing | +            | +           | -          | -                    | 7, 10, 16  |
| 15. Merismopedia sparsa Komárek & G.Cronberg | +            | -           | -          | -                    | 30         |
| 16. Merismopedia tranquiíla (Ehrenberg) Trevisan | +            | +           | -          | -                    | 2, 12, 16  |
| 17. Merismopedia warmingiana (Lagerheim) Forti | +            | +           | +          | -                    | 16         |
| 18. Synechocystis aquatilis Sauvageau | +            | +           | -          | -                    | 10, 11, 16 |
| 19. Synechocystis prevollii Ercegovic | +            | +           | +          | -                    | 11, 19, 21 |
| **Family Coelosphaeriaceae** |            |             |           |                      |            |
| 20. Coelosphaerium aerugineum Lemmernann | +            | -           | -          | -                    | 16         |
| 21. Coelosphaerium dubium Grunow | +            | -           | -          | -                    | 16         |
| 22. Snowella lacustris (Chodat) Komárek & Hindák | +            | -           | -          | -                    | 16         |
| **Family Pseudanabaenaceae** |            |             |           |                      |            |
| 23. Limnothrix redekei (Goor) Meffert | -            | +           | -          | -                    | 21         |
| 24. Pseudanabaena amphigranulata (Goor) Anagnostidis | +            | -           | -          | -                    | 10         |
| 25. Pseudanabaena catenata Lauterborn | +            | +           | -          | -                    | 16         |
| 26. Pseudanabaena galeata Böcher | +            | -           | -          | -                    | 16         |
| 27. Pseudanabaena limnetica (Lemmernann) Komárek | +            | -           | -          | -                    | 16         |
| 28. Pseudanabaena minima (G.S.An) Anagnostidis | +            | +           | -          | -                    | 16         |
| 29. Pseudanabaena muscolosa (Naumann & Huber-Pestalozzi) Schwabae | -            | +           | +          | -                    | 16, 20     |
| **Family Leptolyngbyaceae** |            |             |           |                      |            |
| 30. Leptolyngbya gracilis (Rabenhorst ex Gomont) Anagnostidis & Komárek | +            | +           | -          | -                    | 11         |
| 31. Leptolyngbya africana (Lemmernann) Anagnostidis & Komárek | +            | +           | -          | -                    | 12, 20     |
| Taxonomic Assignment | Planktonic | Terrestrial | Epilithic | Epiphytic/Endophytic | References |
|----------------------|------------|-------------|-----------|----------------------|------------|
| 32 Leptolyngbya amplivaginata (Goor) Anagnostidis & Komárek | + | - | - | - | 16 |
| 33 Leptolyngbya boryana (Gomont) Anagnostidis & Komárek | - | + | - | - | 31 |
| *Plectonema boryanum Gomont | | | | | |
| 34 Leptolyngbya foveolarum (Gomont) Anagnostidis & Komárek | - | + | - | - | 12, 20, 27 |
| *Phormidium foveolarum Gomont | | | | | |
| 35 Leptolyngbya fragilis (Gomont) Anagnostidis & Komárek | - | + | + | - | 10, 12 |
| *Phormidium fragile Gomont | | | | | |
| 36 Leptolyngbya mucosa (N.L.Gardner) Anagnostidis & Komárek | - | + | - | - | 10, 20 |
| *Phormidium mucosum N.L.Gardner | | | | | |
| 37 Leptolyngbya nostocorum (Bornet ex Gomont) Anagnostidis & Komárek | - | + | - | - | 20 |
| *Plectonema nostocorum Bornet ex Gomont | | | | | |
| 38 Leptolyngbya perelegans (Lemmerrmann) Anagnostidis & Komárek | + | + | - | - | 6 |
| *Lyngbya perelegans Lemmerrmann | | | | | |
| 39 Leptolyngbya polysiphoniae (Frémy) Anagnostidis & Komárek | - | - | + | - | 2 |
| *Lyngbya polysiphoniae Frémy | | | | | |
| 40 Leptolyngbya purpurascens (Gomont ex Gomont) Anagnostidis & Komárek | - | - | + | - | 7 |
| *Phormidium purpurascens Gomont ex Gomont | | | | | |
| 41 Leptolyngbya scottii (F.E.Fritsch) Anagnostidis & Komárek | - | + | - | - | 10, 12 |
| *Lyngbya scottii Fritsch | | | | | |
| 42 Leptolyngbya truncata (Lemmerrmann) Anagnostidis & Komárek | + | - | - | - | 16 |
| 43 Leptolyngbya valderiana (Gomont) Anagnostidis & Komárek | - | + | + | - | 7, 18, 20 |
| *Phormidium valderianaum Gomont | | | | | |
| 44 Phormidesmis molle (Gomont) Turicchia, Ventura, Komárková & Komárek | + | + | - | - | 12, 20, 22 |
| *Phormidium molle Gomont | | | | | |
| Family Trichocoleusaceae | | | | | |
| 45 Trichocoleus delicatulus (West & G.S.West) Anagnostidis | + | + | - | - | 16 |
| 46 Trichocoleus hospitus Hansgirg | - | - | + | - | 16 |
| 47 Trichocoleus sociatus (West & G.S.West) Anagnostidis | + | + | - | - | 10, 11 |
| *Microcoleus sociatus West & G.S.West | | | | | |
| Family Oculatellaceae | | | | | |
| 48 Drouettella lurida (Gomont) Mai, J.R.Johansen & Pietrasiak | - | - | + | - | 7 |
| *Phormidium luridum Gomont | | | | | |
| Family Synechococcales familia incertae sedis | | | | | |
| 49 Dasygloea amorpha Berkeley ex Gomont | + | - | - | - | 16 |
| 50 Heteroleibleinia gardneri (Geitler) Anagnostidis & Komárek | + | + | - | - | 6 |
| *Lyngbya gardneri Geitler | | | | | |
| 51 Heteroleibleinia kuetzingii (Schmidle) Compère | + | - | - | - | 10 |
| *Lyngbya kuetzingii Schmidle | | | | | |
| 52 Heteroleibleinia lachneri (W.Zimmermann) Anagnostidis & Komárek | - | - | + | + | 10, 12 |
| *Lyngbya lachneri (W.Zimmermann) Geitler | | | | | |
| 53 Heteroleibleinia mesotricha (Skuja) Anagnostidis & Komárek | - | + | - | - | 20 |
| *Lyngbya mesotricha Skuja | | | | | |
| 54 Jaaginema angustissimum (West & G.S.West) Anagnostidis & Komárek | - | + | - | - | 16 |
| 55 Jaaginema borodinii (Woronichin) Anagnostidis & Komárek | - | + | - | - | 16 |
| 56 Jaaginema subtilissimum (Kützing ex Forl) Anagnostidis & Komárek | + | + | - | - | 11, 16 |
| *Oscillatoria subtilissima Kützing ex Forl | | | | | |
| 57 Schizothrix arenaria Gomont | - | + | - | - | 16 |
| 58 Schizothrix hauseri Grunow ex Gomont | - | + | - | - | 16 |
| 59 Schizothrix lateritia Gomont | - | - | + | - | 7 |
| 60 Schizothrix mexicana Gomont | + | - | - | - | 1 |
| Subclass Oscillatoriophycidae | | | | | |
| Order Spirulinales | | | | | |
| 61 Spirulina labyrinthiformis Gomont | - | + | - | - | 12, 16 |
| 62 Spirulina major Kützing ex Gomont | + | - | - | - | 16 |
| Taxonomic Assignment | Planktonic | Terrestrial | Epilithic | Epiphytic/Endophytic | References |
|----------------------|------------|-------------|-----------|----------------------|------------|
| 63 Spirulina meneghiniana Zanardini ex Gomont | + | - | - | - | 16 |
| 64 Spirulina platensis var. tenuis C.B.Rao *Arthrospira platensis tenuis (C.B.Rao) Desikachary | + | - | - | - | 11 |
| 65 Spirulina princeps West & G.S.West | + | + | - | - | 7, 12, 20 |
| 66 Spirulina subsalsa Generst ex Gomont | + | + | - | - | 11, 16 |
| 67 Spirulina subtilissima Kützing ex Gomont | - | + | - | - | 11 |
| 68 Spirulina tenerime Kützing ex Gomont | - | + | - | - | 16 |
| **Order Chroococcales** | | | | | |
| **Family Microcystaceae** | | | | | |
| 69 Gloeocapsa aeruginosa Kützing | - | + | + | - | 7, 12 |
| 70 Gloeocapsa calicarea Tilden | - | - | + | - | 16 |
| 72 Gloeocapsa decorticans (A.Braun) P.Richter | - | + | - | - | 16 |
| 73 Gloeocapsa kuetzingiana Nägeli ex Kützing | - | - | + | - | 10 |
| 74 Gloeocapsa livida (Carmichael) Kützing | + | + | - | - | 16 |
| 75 Gloeocapsa nigrescens Nägeli | + | - | - | - | 11 |
| 76 Gloeocapsa pleurocapsoides Novácek | - | - | + | - | 7 |
| 77 Gloeocapsa punctata Nägeli | - | + | - | - | 16 |
| 78 Gloeocapsa quaternata Kützing | - | - | - | + | 10 |
| 79 Gloeocapsa sanguinea (C.Agardh) Kützing | - | - | - | + | 10 |
| 80 Microcystis aeruginosa (Kützing) Kützing | + | + | - | - | 6, 11, 12, 16, 30 |
| 81 Microcystis elongata Desikachary | + | - | - | - | 12 |
| 82 Microcystis flosaquae (Wittrock) Kirchner | + | - | - | - | 7, 11, 16 |
| 83 Microcystis marginata (Meneghinii) Kützing | + | - | - | - | 12 |
| 84 Microcystis proteocystis W.B. Crow | + | - | - | - | 12 |
| 85 Microcystis pulvere (H.C.Wood) Forti | + | - | - | - | 12, 16 |
| 86 Microcystis pulvere f. irregularis (J.B.Petersen) Elenkin *Aphanocapsa lachistoa var. irregularis J.B.Petersen | + | - | - | - | 16 |
| 87 Microcystis scripta (P.Richter) Lemmermann | + | - | - | - | 16 |
| 88 Microcystis smithii Komárek & Anagnostidis *Aphanocapsa pulchra (Kützing) Rabenhorst | + | + | - | - | 11, 12 |
| 89 Microcystis viridis (A.Braun) Lemmermann | + | - | - | - | 16 |
| 90 Microcystis wesenbergii (Komárek) Komárek ex Komárek | + | - | - | - | 16 |
| **Family Aphanotheceae** | | | | | |
| 91 Aphanothece microcapsica Nägeli | + | + | - | - | 6, 12, 16 |
| 92 Aphanothece naegeli Warthmann | - | + | - | - | 11, 16 |
| 93 Aphanothece nidulans P.Richter | + | - | - | - | 16 |
| 94 Aphanothece pollida (Kützing) Rabenhorst | + | + | - | - | 11 |
| 95 Aphanothece saxicola Nägeli | + | + | - | - | 16 |
| 96 Aphanothece stagnina (Sprengel) A.Braun | - | + | - | - | 7, 11 |
| 97 Gloeocethe membranacea (Rabenhorst) Bornet | - | + | - | - | 12 |
| 98 Gloeocethe rupestris (Lyngbye) Bornet | - | + | - | - | 6, 12 |
| 99 Gloeocethe samoensis Will | - | + | - | - | 7 |
| **Family Cyanobacteriaceae** | | | | | |
| 100 Cyanobacterium cedrorum (Sauvageau) Komárek, J. Kapecký & Cepák *Synechococcus cedrorum Sauvageau | + | + | - | - | 10, 12 |
| Taxonomic Assignment | Planktonic | Terrestrial | Epilithic | Epiphytic/Endophytic | References |
|----------------------|------------|-------------|-----------|----------------------|------------|
| Family Cyanothrichaceae |            |             |           |                      |            |
| 101 Johannesbaptista pellucida (Dickie) W.R.Taylor & Drouet | + | - | - | - | 16 |
| Family Gomphosphaeriaceae |            |             |           |                      |            |
| 102 Gomphosphaeria natans Komárek & Hindák | + | - | - | - | 16 |
| Family Chroococcaceae |            |             |           |                      |            |
| 103 Asterocapsa nidulans (N.L.Gardner) Komárek & Komárková-Legnerová *Anacystis nidulans N.L.Gardner | + | - | - | - | 15 |
| 104 Chroococcus indicus Zeller | - | + | - | - | 20 |
| 105 Chroococcus minutus (Kützing) Nägeli | + | - | - | - | 7 |
| 106 Chroococcus minor (Kützing) Nägeli | + | + | + | - | 10, 11, 12, 16 |
| 107 Chroococcus minutus (Kützing) Nägeli | + | + | + | - | 7, 11, 16 |
| 108 Chroococcus pollidus Nägeli | - | + | - | - | 11 |
| 109 Chroococcus subnudus (Hanșig) G.Cronberg & J.Komárek | + | - | - | - | 16 |
| 110 Chroococcus turgidus (Kützing) Nägeli | - | + | - | - | 12 |
| 111 Chroococcus varius A.Braun | + | - | - | - | 16 |
| 112 Cyanosarcina burmensis (Skuja) Kováčik | - | - | + | - | 16 |
| 113 Cyanosarcina spectabilis (Geitler) Kováčik *Myxosarcina spectabilis Geitler | - | - | - | + | 10 |
| 114 Gloeocapsopsis cyanee (Krieger) Komárek & Anagnostidis | - | + | - | - | 16 |
| 115 Pseudocapsa dubia Ercegovic | + | + | - | - | 16 |
| 116 Dactylococcopsis raphidioides Hansgirg | - | - | - | - | 7 |
| Family Entophysalidaceae |            |             |           |                      |            |
| 117 Chlorogloea microcystoides Geitler | - | - | + | - | 16 |
| Order Pleurocapsales |            |             |           |                      |            |
| Family Dermocarpellaceae |            |             |           |                      |            |
| 118 Stanieria sphaerica (Setchell & N.L.Gardner) Anagnostidis & Pantazidou *Dermocarpa sphaerica Setchell & N.L.Gardner | + | - | - | - | 7 |
| Order Oscillatoriales |            |             |           |                      |            |
| Family Coleofasciculaceae |            |             |           |                      |            |
| 119 Anagnostidinema acutissimum (Kufferath) Strunecký, Bohunická, J.R.Johansen & J.Komárek *Geitlerinema acutissimum (Kufferath) Anagnostidis | - | + | - | - | 31 |
| 120 Anagnostidinema exile (Skuja) Strunecky *Geitlerinema exile (Skuja) Anagnostidis | - | + | - | - | 16 |
| 121 Anagnostidinema ionicum (Skuja) Strunecky *Geitlerinema ionicum (Skuja) Anagnostidis | + | - | - | - | 16 |
| 122 Anagnostidinema lemmerrmanni (Woloszyńska) Struney *Geitlerinema lemmerrmanni (Woloszyńska) Anagnostidis | + | - | - | - | 16 |
| 123 Coleofasciculus chthonoplastes (Thuret ex Gomont) M.Siegesmund, J.R.Johansen & T.Fried in Siegesmund *Microcoleus chthonoplastes Thuret ex Gomont | - | + | - | - | 2, 7, 16 |
| 124 Geitlerinema bigranulatum (C.B.Rao) Anagnostidis *Oscillatoria clarcentrosa f. bigranulata C.B.Rao | - | - | + | - | 6 |
| 125 Geitlerinema crassum (Woronichin) Anagnostidis *Oscillatoria deflexa crassa (Woronichin) Elenkin & Poljansky | + | + | - | - | 2, 11 |
| Family Microcoleaceae |            |             |           |                      |            |
| 126 Arthrospira gigantea (Schmidle) Anagnostidis *Spirulina gigantea Schmidle | + | - | - | - | 10, 11 |
| 127 Arthrospira jenneri Stizenberger ex Gomont | + | + | - | - | 11 |
| 128 Arthrospira khaniae Drouet & Strickland | + | - | - | - | 7 |
| 129 Arthrospira massartii var. indica Desikachary | + | - | - | - | 16 |
| 130 Arthrospira platensis Gomont | + | - | - | - | 12 |
| Taxonomic Assignment | Planktonic | Terrestrial | Epiphytic | Epiphytic/Endophytic | References |
|----------------------|------------|-------------|-----------|----------------------|------------|
| 131 Altorhospira platenis non-constricta (Banerji) Desikachary | + | - | - | - | 12, 16 |
| 132 Kamptonema anamale (C.Agardh ex Gomont) Struneyck, Komárek & J.Smarda *Oscillatoria anamala C.Agardh ex Gomont *Phormidium anamale (C.Agardh ex Gomont) Anagnostidis & Komárek | + | + | + | - | 10, 16 |
| 133 Kamptonema chlorinum (Kützing ex Gomont) Struneyck, Komárek & J.Smarda *Oscillatoria chlorina Kützing ex Gomont *Phormidium chlorinum (Kützing ex Gomont) | + | + | - | - | 6, 11, 12, 16, 22 |
| 134 Kamptonema cortianum (Meneghini ex Gomont) Struneyck, Komárek & J.Smarda *Phormidium cortianum (Meneghini ex Gomont) Anagnostidis & Komárek | - | + | - | - | 16 |
| 135 Kamptonema formosum (Bory ex Gomont) Struneyck, Komárek & J.Smarda *Phormidium formosum (Bory ex Gomont) Anagnostidis & Komárek *Oscillatoria formosa Bory ex Gomont | + | + | + | - | 10, 16, 20 |
| 136 Kamptonema gebrhardtianum (Clau) Struneyck, Komárek & J.Smarda *Phormidium gebrhardtianum (Clau) Anagnostidis & Komárek *Oscillatoria gebrhardtianum (C.Agardh ex Gomont) | - | + | - | - | 16 |
| 137 Kamptonema jasorvense (Vouk) Struneyck, Komárek & J.Smarda *Oscillatoria jasorvense Vouk | - | + | - | - | 16 |
| 138 Kamptonema latevirens (H.M.Crouan & P.L.Crouan ex Gomont) Struneyck, Komárek & J.Smarda *Phormidium latevirens (H.M.Crouan & P.L.Crouan ex Gomont) Anagnostidis & Komárek *Oscillatoria latevirens P.Crouan & H.Crouan ex Gomont | - | + | - | - | 16, 20 |
| 139 Kamptonema okennii (C.Agardh ex Gomont) Struneyck, Komárek & J.Smarda *Oscillatoria okennii C.Agardh ex Gomont *Phormidium okennii (C.Agardh ex Gomont) Anagnostidis & Komárek | + | + | + | - | 11, 12, 16 |
| 140 Kamptonema proteus (Skuja) Struneyck, Komárek & J.Smarda *Oscillatoria proteus Skuja | + | + | - | - | 7, 12 |
| 141 Microcoleus amoenus (Gomont) Struneyck, Komárek & J.R.Johansen Struneyck *Phormidium amoenum Kützing ex Anagnostidis & Komárek | - | + | - | - | 16 |
| 142 Microcoleus autumnalis (Gomont) Struneyck, Komárek & J.R.Johansen *Phormidium autumnale Gomont | - | + | + | - | 16 |
| 143 Microcoleus lacustris Desikachary | - | + | - | - | 16 |
| 144 Microcoleus lacustris f. intermedius Vasishta | - | + | - | - | 7 |
| 145 Microcoleus paludosus Gomont | + | + | - | - | 7, 11, 16 |
| 146 Microcoleus subtorulosus Gomont ex Gomont | + | + | - | - | 11 |
| 147 Microcoleus vaginatus Gomont ex Gomont | + | + | - | - | 11 |
| 148 Oxynema acuminatum (Gomont) Chatchawan, Komárek, Struneyck, Smarda & Peetarpornsial *Oscillatoria acuminata Gomont | + | + | - | - | 20 |
| 149 Plankothrix agardhi (Gomont) Anagnostidis & Komárek *Oscillatoria agardhi Gomont | + | + | - | - | 2, 7, 17 |
| 150 Plankothrix compressa (Utermöhl) Anagnostidis & Komárek | + | - | - | - | 16 |
| 151 Plankothrix isothrix (Skuja) Komárek & Komárková | + | - | - | - | 16 |
| 152 Plankothrix rubescens (De Candolle ex Gomont) Anagnostidis & Komárek *Oscillatoria mugeoti Kützing ex Forti | + | - | - | - | 10, 16 |
| 153 Parhyphysiphon kashyapii (Ghose) Anagnostidis & Komárek *Lyngbya kashyapii Ghose | - | + | - | - | 11 |
| 154 Parhyphysiphon notarisii Kützing ex Gomont | - | - | + | - | 16 |
| 155 Parphysiphon shackletoni (West & G.S.West) Anagnostidis & Komárek *Lyngbya shackletoni W. & G.S. West | - | + | - | - | 12 |
| Family Homoeothrichaceae | | | | | |
| 156 Homoeothrix desikacharyensis Vasishta | + | - | - | - | 9 |
| 157 Homoeothrix juliana (Bornet & Flahault ex Gomont) Kirchner | - | - | + | - | 7 |
| 158 Homoeothrix moniliformis Vasishta | - | + | - | - | 9 |
| Taxonomic Assignment | Planktonic | Terrestrial | Epilithic | Epiphytic/Endophytic | References |
|----------------------|------------|-------------|-----------|----------------------|------------|
| **Family Oscillatoriaeae** |            |             |           |                      |            |
| Limnoraphis birgei (G.M.Smith) J.Komárek, E. Zapomelová, J.Smarda, J.Kopecký, E.Rejmáková, J.Woodyhouse, B.A.Neilan & J.Komárková | -          | +          | -         | -                    | 11         |
| Limnoraphis crytotoga (Schkorbatov) J.Komárek, E.Zapomelová, J.Smarda, J.Kopecký, E.Rejmáková, J.Woodyhouse, B.A.Neilan & J.Komárková | +          | +          | -         | -                    | 10, 11, 12, 20 |
| Limnoraphis hieronymiusi (Lemmermann) J.Komárek, E.Zapomelová, J.Smarda, J.Kopecký, E.Rejmánková, J.Woodhouse, B.A.Neilan & J.Komárková | +          | +          | -         | -                    | 7, 11, 12 |
| Limnospira fusiformis (Voronichin) Nowicka-Krawczyk, Mühlsteinová & Hauer | -          | -          | -         | -                    | 16         |
| Limnospira aeruginacea Gomont | -          | +          | -         | -                    | 11, 12 |
| Lyngbya aestuarii Liebman ex Gomont | +          |            | -         | -                    | 7         |
| Lyngbya aestuarii var. arbustiva Brühl & Biswas | -          | -          | -         | -                    | 7         |
| Lyngbya aequicocca C.B.Rao Umezaki & Watanabe *Phormidium anomalum C.B.Rao | +          | +          | -         | +                    | 12, 16     |
| Lyngbya aequicocca Gomont | +          |            | -         | -                    | 16         |
| Lyngbya aeruginoceleus Gomont | -          | +          | -         | -                    | 7         |
| Lyngbya palmarum Brühl & Biswas | +          | +          | -         | -                    | 6         |
| Lyngbya martensiana Meneghini ex Gomont | +          | +          | +         | -                    | 2, 6, 12, 16 |
| Lyngbya major Meneghini ex Gomont | -          | -          | -         | -                    | 7         |
| Lyngbya palmarum Brühl & Biswas | -          |            | -         | -                    | 6         |
| Lyngbya purpurascens Montagne ex Gomont | +          | -          | -         | -                    | 7         |
| Lyngbya semiplena J.Agardh ex Gomont | -          | -          | +         | -                    | 16         |
| Lyngbya spiralis Geitler | +          | +          | -         | -                    | 6, 20, 22 |
| Lyngbya spiritulosides Gomont | -          | +          | -         | -                    | 12         |
| Lyngbya spiritulosides var. minor Vasishta | +          | -          | -         | -                    | 12         |
| Lyngbya trunciola Ghose | -          | -          | -         | +                    | 16         |
| Oscillatoria anguina Bory ex Gomont | +          | -          | -         | +                    | 16         |
| Oscillatoria annae Goor | +          | -          | -         | -                    | 12, 16 |
| Oscillatoria curvipes C.Agardh ex Gomont | +          | +          | -         | -                    | 11, 12, 16 |
| Oscillatoria indica P.C.Silva *Oscillatoria salina Biswas | +          | -          | -         | -                    | 7         |
| Oscillatoria limosa C.Agardh ex Gomont | +          | +          | -         | -                    | 7, 12, 16 |
| Oscillatoria methali Vasishta | -          | -          | -         | -                    | 9         |
| Oscillatoria obscura Brühl & Biswas | -          | +          | -         | -                    | 11         |
| Oscillatoria penornata Skuja | +          | -          | -         | -                    | 16         |
| Oscillatoria principes Vaucher ex Gomont | +          | +          | -         | -                    | 1, 11     |
| Oscillatoria sancta Kützing ex Gomont | +          | +          | -         | -                    | 7, 11, 12, 16 |
| Oscillatoria simplicissimo Gomont | +          | -          | -         | -                    | 12         |
| Oscillatoria subbrevis Schmidle | +          | +          | -         | -                    | 2, 6, 11, 12, 20 |
| Oscillatoria tenuis C.Agardh ex Gomont | +          | -          | -         | -                    | 16         |
| Oscillatoria variabilis C.B.Rao *Oscillatoria noz G. De Toni | +          | -          | -         | -                    | 11, 12 |
| Phormidium abronema Skuja | -          | +          | -         | -                    | 12         |
| Phormidium allorgei (Frémy) Anagnostidis & Komárek | -          | -          | -         | -                    | 6         |
| Phormidium allorgei (Frémy) Anagnostidis & Komárek | -          | -          | -         | -                    | 10, 16     |
| Phormidium articulatum (N.L.Gardner) Anagnostidis & Komárek | +          | -          | -         | -                    | 16         |
| Taxonomic Assignment | Planktonic | Terrestrial | Epilithic | Epiphytic/Endophytic | References |
|----------------------|------------|-------------|-----------|----------------------|------------|
| Phormidium boryanum (Bory ex Gomont) Anagnostidis & Komárek | + | + | - | - | 11, 12 |
| Phormidium breve (Kützing ex Gomont) Anagnostidis & Komárek | - | + | - | - | 16 |
| Phormidium bulgaricum (Komárek) Anagnostidis & Komárek | + | - | - | - | 16 |
| Phormidium calcareum Kützing ex Gomont | - | - | + | - | 16 |
| Phormidium corbieri (Frémy) Anagnostidis | - | - | + | - | 16 |
| Phormidium coriolum Lemmermann | + | - | - | - | 12 |
| Phormidium favosum Gomont | + | - | + | - | 16 |
| Phormidium foreaui (Frémy) Umezaki & Watanabe | *Oscillatoria foreaui Frémy | + | - | - | 10, 11, 12 |
| Phormidium granulatum (N.L.Gardner) Anagnostidis | - | + | - | - | 16 |
| Phormidium hieronymusii Lemmermann | - | + | - | - | 10 |
| Phormidium interruptum Kützing ex Forti | - | - | + | - | 16 |
| Phormidium inundatum Kützing ex Gomont | - | + | - | - | 20 |
| Phormidium jadinianum Gomont | - | + | - | - | 12 |
| Phormidium janthiphorum (Gomont) Elenkin | *Lyngbya stagnina Kützing | + | - | - | 16, 24 |
| Phormidium karakalpakense (Muzafarov) Anagnostidis & Komárek | - | + | - | - | 16 |
| Phormidium kuetzingianum (Kirchner ex Hansgirg) Anagnostidis & Komárek | + | - | - | - | 12 |
| Phormidium molle var. tenuior West & G.S.West ex Geitler | *Phormidium molle f. tenuior West & G.S.West | - | - | + | - | 10 |
| Phormidium nigrum (Vaucher ex Gomont) Anagnostidis & Komárek | + | - | - | - | 16 |
| Phormidium papyraceum Gomont ex Gomont | - | + | - | - | 12 |
| Phormidium rubriterricola N.L.Gardner | - | + | - | - | 16 |
| Phormidium schultzii (Lemmermann) Anagnostidis & Komárek | *Oscillatoria schultzii Lemmermann | - | + | - | - | 11 |
| Phormidium stagninum Anagnostidis | + | - | + | - | 16, 24 |
| Phormidium stagninum var. minus Vasishta | - | - | + | - | 10 |
| Phormidium subfuscum Kützing ex Gomont | - | + | - | - | 16 |
| Phormidium subincrustatum Fritsch & M.F.Rich | - | + | - | - | 12 |
| Phormidium takyricum (Novichkova) O.N.Vinogradova | *Phormidium paulsenianum f. takyricum Novichkova | + | - | - | - | 16 |
| Phormidium terebriforme (C.Agardh ex Gomont) Anagnostidis & Komárek | *Oscillatoria terebriformis C.Agardh ex Gomont | + | - | - | - | 2, 11 |
| Phormidium tergestinum (Rabenhorst ex Gomont) Anagnostidis & Komárek | - | + | - | - | 16 |
| Phormidium thwaitesi I.Umezaki & M.Watanabe | - | - | + | - | 10 |
| Phormidium tortuosum (N.L.Gardner) Anagnostidis & Komárek | + | - | - | - | 16 |
| Phormidium uncinatum Gomont ex Gomont | - | + | - | - | 16 |
| Phormidium ustrei Schmidle | - | + | - | - | 12 |
| Phormidium wiliei (N.L.Gardner) Anagnostidis & Komárek | *Oscillatoria wiliei N.L.Gardner | - | + | - | - | 11 |

**Family Phormidiaceae**

**Sub Family Phormidioideae**

| Taxonomic Assignment | Planktonic | Terrestrial | Epilithic | Epiphytic/Endophytic | References |
|----------------------|------------|-------------|-----------|----------------------|------------|
| Potamolinea aerugineocarateae (Gomont) M.D.Martins & L.H.Z.Branco | + | + | - | - | 7, 16 |
| Taxonomic Assignment | Planktonic | Terrestrial | Epilithic | Epiphytic/Endophytic | References |
|---------------------|------------|-------------|-----------|----------------------|------------|
| **Family Gomontiellaceae** | | | | | |
| 232 Komvophoron breve (N.Carter) Anagnostidis | - | + | - | - | 16 |
| 233 Komvophoron greenlandicum Anagnostidis et Komarek | + | - | - | - | 16 |
| **Subclass Nostocophycidae** | | | | | |
| **Order Nostocales** | | | | | |
| **Family Scytonemataceae** | | | | | |
| 234 Scytonema burmanicum Skuja | - | - | + | - | 16 |
| 235 Scytonema hofmannii C.Agardh ex Bornet & Flahault | - | + | - | - | 10, 16 |
| 236 Scytonema iyengari Bharadwaja | - | - | + | - | 2 |
| 237 Scytonema julianum Meneghini ex B.A.Whitton | - | - | + | - | 16 |
| 238 Scytonema leptobasis S.L.Ghose | - | - | + | - | 16 |
| 239 Scytonema millei Bornet ex Bornet & Flahault | - | + | - | - | 10 |
| 240 Scytonema ocellatum Lyngbye ex Bornet & Flahault | - | + | + | - | 10, 16 |
| 241 Scytonema pseudhofmanni Bharadwaja | - | + | + | - | 16 |
| 242 Scytonema saleyeriense Weber-van Bosse | + | - | + | - | 16 |
| 243 Scytonema simplex Bharadwaja | + | - | - | - | 16 |
| 244 Scytonema simplex f. majori Vasitha | + | - | - | - | 7 |
| 245 Scytonema tolypothrichiodes Küting ex Bornet & Flahault | - | + | - | - | 16 |
| 246 Scytonema varium Küting ex Bornet & Flahault | - | + | - | - | 17 |
| **Family Rivulariaceae** | | | | | |
| 247 Microchaete tenera var. major Möbius | - | - | - | + | 10 |
| 248 Rivularia joshii Vasitha | + | - | - | - | 8, 11 |
| 249 Rivularia mehrai Vasitha | - | + | - | - | 5 |
| **Family Tolypothrichaceae** | | | | | |
| 250 Tolypothrix crassa West & G.S.West | - | - | - | + | 7 |
| 251 Tolypothrix campylonemoides S.L.Ghose | - | - | - | + | 7 |
| **Family Chlorogloeopsidaceae** | | | | | |
| 252 Chlorogleopsis fritschii (A.K.Mitra) A.K.Mitra & D.C.Pandey | - | + | - | - | 16 |
| **Family Hapalosiphonaceae** | | | | | |
| 253 Hapalosiphon welwitschi/West & G.S.West | - | + | - | - | 16 |
| 254 Mastigocladius laminausus Cohn ex Kirchner | - | + | - | - | 7, 16 |
| 255 Westiellopsis proliferica Janet | - | + | - | - | 17 |
| **Family Gloeotrichiaceae** | | | | | |
| 256 Gloeotrichia ghosei R.N.Singh | - | + | - | - | 11 |
| 257 Gloeotrichia natans Rabenhorst ex Bornet & Flahault | *Rivularia natans (Hedwig) S.F.Gray | + | - | - | 1 |
| 258 Gloeotrichia raciborskii var. kashiensis C.B.Rao | - | - | - | + | 7 |
| **Family Calothricaceae** | | | | | |
| 259 Calothrix braunii Bornet & Flahault | - | + | - | - | 7, 11 |
| 260 Calothrix castellii var. somastipurensis C.S.Rao | + | - | - | - | 16 |
| 261 Calothrix clavata G.S.West | - | + | - | - | 16 |
| 262 Calothrix desikacharyensis Vasitha | - | - | - | + | 9 |
| 263 Calothrix fusca Bornet & Flahault | - | + | - | - | 2 |
| 264 Calothrix parietina Thuret ex Bornet & Flahault | - | + | - | - | 7 |
| **Family Aphanizomenonaceae** | | | | | |
| 265 Anabaenopsis arnoldii Aptekar | + | - | - | - | 16 |
| Taxonomic Assignment | Planktonic | Terrestrial | Epilithic | Epiphytic/Endophytic | References |
|----------------------|------------|-------------|-----------|----------------------|------------|
| 266 Anabaenopsis circularis (G.S.West) Woloszynska & V.V.Miller | + | - | - | - | 16 |
| 267 Dolichospermum nathii (Vasishta) Wacklin, L.Hoffmann & Komárek | + | - | - | - | 3 |
| *Anabaena nathii Vasishta | + | - | - | - | 1, 6, 7 |
| 268 Nodularia spumigena Mertens ex Bornet & Flahault | + | - | - | - | 6 |
| **Family Nostocaceae** | | | | | |
| 269 Anabaena ambiguus C.B.Rao | - | + | - | - | 11 |
| 270 Anabaena anomala F.E.Fritsch | - | + | - | - | 11 |
| 271 Anabaena iyengarii Bharadwaja | + | + | - | - | 10, 14, 16 |
| 272 Anabaena iyengarii var. tenuis C.B.Rao | + | + | - | - | 6, 16 |
| 273 Anabaena mehraii Vasishta | + | - | - | - | 6 |
| 274 Anabaena oryzae F.E.Fritsch | - | + | - | - | 11 |
| 275 Anabaena oscillarioides Bory ex Bornet & Flahault | + | - | - | - | 7 |
| 276 Anabaena oscillarioides var. croasso Vasishta | + | - | - | - | 6 |
| 277 Anabaena spathicosa Bornet & Flahault | + | + | - | - | 11, 14 |
| 278 Anabaena spathicosa var. attenuata Bharadwaja | + | - | - | - | 16 |
| 279 Anabaena spathicosa f. major Kiselev | + | - | - | - | 7 |
| 280 Anabaena turulosa Lagerheim ex Bornet & Flahault | + | + | - | - | 11, 12, 20, 22, 23 |
| 281 Aulosira aenigmatica Frémy | - | + | - | - | 12 |
| 282 Aulosira fertilissima S.L.Ghose | + | + | - | - | 1, 7, 11 |
| 283 Aulosira fertilissima var. tenuis C.B.Rao | + | - | - | - | 16 |
| 284 Aulosira laxa O. Kirchner ex Bornet & Flahault | - | + | - | - | 12 |
| 285 Aulosira prolifica Bharadwaja | + | + | - | - | 6, 11, 12 |
| 286 Aulosira pseudoramosa Bharadwaja | - | + | - | - | 16 |
| 287 Camptylonemopsis iyengarii Desikachary | - | - | - | + | 16 |
| 288 Cylindrospermum alatosporum F.E.Fritsch | - | + | - | - | 6 |
| 289 Cylindrospermum doryphorum Brühl & Biswas | - | + | - | - | 16 |
| 290 Cylindrospermum licheniforme Kützing ex Bornet & Flahault | + | - | - | - | 10 |
| 291 Cylindrospermum majus Kützing ex Bornet & Flahault | - | + | - | - | 11, 16 |
| 292 Cylindrospermum michailovskoense Kiselev | - | + | - | - | 16 |
| 293 Cylindrospermum musciola Kützing ex Bornet & Flahault | + | + | - | - | 2, 6 |
| 294 Cylindrospermum musciola var. kashmiriensis Bharadwaja | - | + | - | - | 16 |
| 295 Cylindrospermum musciola f. hastiapurense Vasishta | - | + | - | - | 7 |
| 296 Cylindrospermum stagnale Bornet & Flahault | + | + | - | - | 1, 16 |
| 297 Desmonostoc muscorum (C.Agardh ex Bornet & Flahault) Hrouzek & Ventura in Hrouzek | - | + | - | - | 7, 13, 16, 29 |
| *Nostoc muscorum C.Agardh ex Bornet & Flahault | - | + | - | - | 7, 13, 16, 29 |
| 298 Nostoc carneum C.Agardh ex Bornet & Flahault | + | + | - | - | 10, 12, 16, 20 |
| *Nostoc spongioformae C.Agardh ex Bornet & Flahault | + | + | - | - | 10, 12, 16, 20 |
| 299 Nostoc commune C.Agardh ex Bornet & Flahault | - | + | - | - | 16 |
| 300 Nostoc commune Vaucher ex Bornet & Flahault | - | + | - | - | 12 |
| 301 Nostoc ellipsoasporum Rabenhorst ex Bornet & Flahault | + | + | - | - | 6, 17 |
| 302 Nostoc haei S.C.Dixit | + | - | - | - | 16 |
| 303 Nostoc linckia Bornet ex Bornet & Flahault, *Nostoc piscinale Kützing ex Bornet & Flahault | - | + | - | - | 6, 12, 16, 20 |
| 304 Nostoc maculiforme Bornet & Flahault | + | + | - | - | 7, 11 |
| 305 Nostoc paludosum Kützing ex Bornet & Flahault *Nostoc entophytum Bornet & Flahault | - | + | - | - | 12, 16 |
| 306 Nostoc parmelodes Kutz. ex Born.e/ Flah. | - | + | - | - | 16 |
| Taxonomic Assignment | Planktonic | Terrestrial | Epilithic | Epiphytic/Endophytic | References |
|----------------------|------------|-------------|-----------|----------------------|------------|
| 307 Nostoc punctiforme | -          | +           | -         | -                    | 6, 12, 16  |
| 308 Nostoc spongiiiforme var. tenue C.B.Rao | -          | +           | -         | -                    | 10         |
| 309 Nostoc verrucosum Vaucher ex Bornet & Flahault | -          | -           | +         | -                    | 2, 6       |
| 310 Trichormus azolae (Strasburger) Komárek & Anagnostidis | -          | -           | +         | -                    | 16         |
| 311 Trichormus fertilissimus (C.B.Rao) Komárek & Anagnostidis | -          | -           | +         | -                    | 28         |
| *Anabaena fertilissima C.B.Rao | -          | -           | +         | -                    | 4          |
| 312 Trichormus hasiarpurensis (Vasishta) Komárek & Anagnostidis | *         | -           | +         | -                    | 20, 26     |
| *Anabaena variabilis Kützing ex Bornet & Flahault Komárek & Anagnostidis | +          | -           | +         | -                    | 16, 20     |
| 313 Trichormus indicus Komárek | +          | -           | +         | -                    | 10         |
| *Anabaena vaginicola f. fertilissima Prasad | +          | -           | +         | -                    | 7          |
| *Anabaena naviculoides F.E.Fritsch | +          | -           | +         | -                    | 6          |
| 314 Trichormus naviculoides (F.E.Fritsch) J.Komárek & K.Anagnostidis | +          | -           | +         | -                    | 20, 26     |
| 315 Trichormus variabilis (Kützing ex Bornet & Flahault) Komárek & Anagnostidis | +          | -           | +         | -                    | 16, 20     |
| *Anabaena variabilis Kützing ex Bornet & Flahault | +          | -           | +         | -                    | 10         |
| 316 Wolleia bharadwajae R.N.Singh | -          | -           | +         | -                    | 7          |
| 317 Wolleia vaginicola (F.E.Fritsch & Rich) R.N.Singh | -          | -           | +         | -                    | 6          |

Previously accepted name/synonym of taxa are marked with star *'

1—Randhawa (1936) | 2—Singh (1941) | 3—Vasishta (1960a) | 4—Vasishta (1960b) | 5—Vasishta (1960c) | 6—Vasishta (1960d) | 7—Vasishta (1961) | 8—Vasishta (1962) | 9—Vasishta (1963a) | 10—Vasishta (1963b) | 11—Grover & Pandhol (1975) | 12—Sarma (1979) | 13—Surekha (1989) | 14—Reena (1992) | 15—Khattar et al. (1999) | 16—Dhingra (2006) | 17—Singh et al. (2007) | 18—Khattar & Jindal (2008) | 19—Khattar & Shailza (2009) | 20—Singh et al. (2009) | 21—Khattar et al. (2010) | 22—Shailza (2010) | 23—Singh et al. (2012) | 24—Jindal et al. (2013) | 25—Sharma et al. (2013) | 26—Singh et al. (2013) | 27—Singh et al. (2014) | 28—Khattar et al. (2015) | 29—Singh et al. (2015) | 30—Kaur et al. (2017) | 31—Manpreet (2017).

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